INVESTIGATING THE EFFICACY OF IN VIVO EXPOSURE AS AN ADDITIVE ELEMENT TO COGNITIVE BEHAVIOR THERAPY FOR EATING DISORDERS: A MULTIPLE-BASELINE DESIGN ACROSS BEHAVIORS

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ABSTRACT

Cognitive behavior therapy (CBT) has proven to be an effective treatment for many individuals with eating disorders. On the other hand, a substantial proportion of eating disorder patients fail to recover through CBT and other tested treatments. To improve the efficacy of the approach, it may be helpful to add treatment elements that are effective for partially related conditions, such as anxiety disorders. Therapist-assisted *in vivo* exposure (IVE), one of the most supported interventions for anxiety disorders, may reduce distress and increase self-efficacy for a range of foods and eating, weight, and shape situations that patients with eating disorders fear and avoid. To investigate the efficacy of IVE as an additive element to CBT, a multiple-baseline design across behaviors was conducted using patients at a university-based outpatient eating disorder clinic. For each participant, distress and self-efficacy ratings were examined at multiple time points before and after each IVE session. Changes in distress and self-efficacy ratings for the variables targeted by each IVE were compared to variables not targeted by the exposure session. As predicted, visual inspection of mean and level generally found a decrease in distress and an increase in self-efficacy ratings following IVE sessions; however, this pattern of change also often occurred for variables that were not directly targeted by the IVE. According to visual inspection of trend, target variables generally did not exhibit predicted changes in slope following IVE sessions. Analyses using within-subject Cohen's *d* effect sizes tended to converge with findings from visual inspection of mean, while the adjusted R^2 values computed via Allison's mean plus trend difference were similar to results from visual inspection of trend. Although limitations with the study's design preclude conclusions about whether IVE contributed to reductions in anxiety or improvements in self-efficacy specific to target variables,

the results suggest that challenging IVE sessions were perceived as valuable by some participants. Further research is warranted to understand the efficacy of IVE, a potentially valuable additive component to CBT for eating disorders.

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Introduction

Sir William Gull coined the term "anorexia nervosa" (AN) in 1874, and medical descriptions of the condition can be found as far back as 1689 (Pearce, 2004). Despite the early identification of AN, surprisingly little is known about how to resolve the disorder (Walsh, 2013). Research over the past half century has failed to provide convincing evidence of improved treatments for AN (Steinhausen, 2002), in many ways providing more guidance on what approaches to *avoid* than to implement (Vitousek & Gray, 2005). AN continues to rank among the most dangerous psychiatric disorders, with an estimated mortality rate of 5% (Steinhausen, 2009). In contrast, clear clinical cases of bulimia nervosa (BN) did not emerge until the 1970s (Russell, 1997). In a relatively short period of time, effective treatment approaches have been established for BN, particularly cognitive behavior therapy (CBT; Fairburn, 2008; Waller, 2016; Wilson, Grilo, & Vitousek, 2007). The physical and psychological consequences of BN are not as severe as those of AN, with an approximate crude mortality rate of less than 1% (Steinhausen, 2009). On the other hand, a substantial proportion of BN patients who receive CBT fail to recover (Wilson et al., 2007). Moreover, long-term studies find that both BN and AN exhibit a chronic course and high relapse rates, and not infrequently develop into a lifelong unspecified eating disorder (Steinhausen, 2009).

Eating disorders are complex conditions, exhibiting symptoms of and comorbidity with mood, anxiety, obsessive-compulsive, impulse-control, substance use, and/or personality disorders (Braun, Sunday, & Halmi, 1994; Hudson, Hiripi, Pope, & Kessler, 2007; Rastam, 1992). Patients with eating disorders, particularly AN, also demonstrate distinctive features that further complicate the clinical picture and thwart successful treatment, including an intrinsic

motivation to maintain certain symptoms, resistance to change, physical and psychological consequences of semi-starvation, and the cultivation of fear as a mechanism for dieting and weight loss (Garner, Vitousek, & Pike, 1997; Vitousek, Watson, & Wilson, 1998; Vitousek & Gray, 2005). Research investigating novel treatment approaches for eating disorders is undoubtedly warranted. Evidence-based approaches for psychological conditions that overlap with eating disorders may serve as good candidates to investigate. Before importing successful interventions for other conditions, however, the unique features of eating disorders should be considered. The clinical features of eating disorder may inform whether and how interventions should be modified to appropriately fit this clinical population.

Clinical Features of Eating Disorders

The *Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition* (DSM-5; American Psychiatric Association, 2013) identifies AN, BN, and binge-eating disorder (BED) as the three primary eating disorders. Unlike the feeding and eating disorders of infancy and early childhood, symptoms of AN, BN, and BED usually emerge in adolescence or young adulthood (American Psychiatric Association, 2013). Both AN and BN are typified by core beliefs about the importance of weight and shape as a measure of self-worth, which contribute to the development of stereotyped behaviors to try to control body weight (Fairburn, Cooper, & Shafran, 2003). These behaviors typically include significant dietary restraint, binge eating, and/or compensatory behaviors such as self-induced vomiting, laxative use, and excessive exercise. Although BN is defined by binge eating and purging, these symptoms do not distinguish the disorder from all cases of AN: individuals with the binge-eating/purging type of AN also experience recurrent episodes of binge eating and/or purging, in contrast to those with

the restricting type of AN. What does differentiate the diagnoses of AN and BN is body weight: while AN is characterized by low body weight, BN is associated with body weight at or above a normal range. Both disorders disproportionately affect women, who are approximately ten times more likely than men to experience AN or BN. Among young females, the twelve-month prevalence is approximately 0.4% for AN and 1 – 1.5% for BN (American Psychiatric Association, 2013).

Individuals who exhibit impairment from disordered eating but do not meet full criteria for AN, BN, or BED typically fall under the diagnostic category of "other specified feeding or eating disorder" (OSFED) or "unspecified feeding or eating disorder" (American Psychiatric Association, 2013). Examples of presentations that are subsumed under the heterogeneous category of OSFED include: "atypical anorexia," in which all criteria for AN are met but the individual's weight is within or above normal limits; "bulimia nervosa (of low frequency and/or limited duration)," in which all criteria for BN are met but the frequency of binge-eating episodes and compensatory behavior is less than once per week and/or the duration is less than three months; and "purging disorder," in which recurrent purging behavior occurs in the absence of binge eating. Previously classified in the DSM-IV as "eating disorders not otherwise specified" (EDNOS), this diverse category of disorders is the most common diagnosis provided to adults and adolescents who exhibit disordered eating (Le Grange, Swanson, Crow, & Merikangas, 2012). Evidence suggests that the clinical severity of EDNOS is comparable to that of AN and BN (Fairburn & Bohn, 2005).

Given the overlapping clinical features of AN, BN, BED, and OSFED, some experts within the field argue that all eating disorders should be conceptualized and treated within a

transdiagnostic framework (Fairburn et al., 2003). According to the transdiagnostic view, AN, BN, BED, and OSFED are better understood as comprising one broad eating disorder diagnostic category rather than representing distinct conditions. Support for this position comes from the similar behavioral and cognitive symptoms of AN, BN, and OSFED. Additionally, individuals with eating disorders commonly experience variation in the severity and form of these symptoms over time, resulting in the "crossing over" from one diagnostic category to the other (Eddy et al., 2008; Fairburn 2008).

Despite the intuitive appeal of the transdiagnostic view of eating disorders, other experts have maintained that meaningful distinctions exist between AN and BN that necessitate somewhat dissimilar treatment approaches for the two conditions (Garner et al., 1997). Of note are distinct personality traits associated with AN and BN. This is particularly true for the perfectionistic and obsessional traits typical of individuals with the restricting type of AN (Vitousek & Manke, 1994). Individuals with AN also commonly present with distinctive features not usually reported by individuals with BN, including deriving a sense of stability, structure, and predictability (Nordbo, Espeset, Gulliksen, Skarderud, & Holte, 2006), identity (Tan, Hope, & Stewart, 2003), pride (Casper & Davis, 1977; Skarderud, 2007), and competitiveness (Leung, Waller, & Thomas, 1999) through the achievement of restraint and thinness. Additionally, diagnostic crossover from the *restrictive type* of AN to BN or vice versa appears to be relatively uncommon (Eddy et al., 2008).

Although there are divergent perspectives on how eating disorders should be conceptualized within a diagnostic framework, cognitive-behavioral treatments designed to treat eating disorders from a transdiagnostic (e.g., Fairburn, 2008) or disorder-specific (e.g., Garner et

al., 1997) perspective overlap substantially. Despite evidence for the superiority of CBT relative to other treatments for BN and BED (Waller, 2016), self-identified cognitive-behavioral therapists exhibit variability in their reported use of CBT interventions when treating eating disorders (Waller, Stringer, & Meyer, 2012). It has been argued that therapist deviation from transdiagnostic CBT manuals for eating disorders is problematic (Waller et al., 2012; Waller, 2016), which may be generally true when treating patients with BN or BED. On the other hand, recent CBT protocols for adults with AN have demonstrated efficacy for only about 30% of patients in the intent-to-treat sample (Fairburn et al., 2013). In view of these modest outcomes, therapist modifications to manualized CBT (e.g., increased use of motivational strategies) when treating adults with AN could be a sign of competent clinical judgment rather than problematic therapist drift.

The Role of Anxiety in Eating Disorders

Comorbidity of anxiety and eating disorders. Eating disorders exhibit high comorbidity with a number of other psychological conditions, including mood, obsessive-compulsive, impulse-control, substance use, personality, and anxiety disorders (Braun et al., 1994; Hudson et al., 2007; Rastam, 1992). Anxiety in particular appears to be a strong risk factor for the development of an eating disorder (Jacobi, Hayward, de Zwann, Kraemer, & Agras, 2004). For decades, researchers have noted an overlap between eating disorders and anxiety disorders, and evidence suggests that women with eating disorders are indeed more likely to have a comorbid anxiety disorder relative to normal controls (Pallister & Waller, 2008). While some of this comorbidity might be explained by the effects of semi-starvation, which can trigger anxiety and obsessive-compulsive behaviors in healthy individuals (Keys, Brožek,

Henschel, Mickelsen, & Taylor, 1950), symptoms of anxiety are often present prior to the onset of an eating disorder (e.g., Bulik, Sullivan, Fear, & Joyce, 1997; Godart et al., 2003) and thus cannot be explained fully by the effects of starvation. Some researchers have posited that individuals with anxiety disorders and eating disorders share a common predisposition for rapid fear conditioning to non-threatening stimuli (e.g., certain foods), which leads to avoidance of these feared stimuli (Hildebrandt, Bacow, Markella, & Loeb, 2012; Strober, 2004).

Anxiety as a feature of eating disorders. Not only are eating and anxiety disorders highly comorbid, anxiety is a prominent feature of many eating disorder symptoms, which contributed to early theories that conceptualized AN as a "weight phobia" or "fat phobia" (Crisp, 1970). Anxiety related to eating, weight, and shape has been found to be associated with binge eating (Arnow, Kenardy, & Agras, 1992), vomiting (Carter & Duncan, 1984), laxative abuse (Weltzin, Bulik, McConaha, & Kaye, 1995), calorie restriction (Chesler, 1995), and poor treatment compliance (Weltzin et al., 1995). Like individuals with anxiety disorders, those with eating disorders also demonstrate attentional bias toward information they perceive as threatening (Pallister & Waller, 2008), such as words related to fatness (Rieger et al., 1998). Among patients with BN, it has been suggested that purging serves as an escape-avoidance behavior that reduces anxiety associated with overeating (Rosen & Leitenberg, 1982), and that binge eating serves as an escape-avoidance response from undesirable affective states (Schmidt & Marks, 1988).

Individuals with eating disorders also display "safety behaviors," which serve to reduce the occurrence of feared outcomes in the short-term but inadvertently maintain anxiety in the long-term (Salkovskis, 1991). Common safety behaviors used by individuals with eating

disorders in an effort to avoid the feared outcome of weight gain include rigid eating patterns, strict dietary rules and restrictions, and body checking and avoidance (Pallister & Waller, 2008). These safety behaviors maintain anxiety over the long-term as the non-occurrence of the feared outcome is attributed to the safety behavior (Salkovskis, 1991). In other words, if an individual believes that eating a high-calorie food will result in uncontrollable weight gain and consequently avoids all high-calorie foods, then she or he will have few opportunities to challenge this belief, contributing to further food avoidance.

Exposure as a Treatment for Anxiety within Eating Disorders

Rationale for exposure as a treatment for anxiety. Given the apparent role of anxiety in the development and maintenance of eating disorders, effective treatment might be achieved by directly targeting anxious cognitions and avoidance behaviors in patients with eating disorders (Pallister & Waller, 2008). Exposure therapy is the most effective psychological intervention for anxiety disorders (Abramowitz, 2013), and stands out as an obvious choice to treat anxiety in patients with eating disorders.

Traditional theories hypothesized that exposure targets fear responses through the behavioral mechanism of extinction (Mowrer, 1939). Specifically, by exposing an individual to a feared stimulus (e.g., a snake) when the feared outcome (e.g., being harmed) does not occur, the association between the stimulus and fear weakens until it is eventually extinguished through repeated exposure trials (i.e., habituation). According to Foa and Kozak's (1986) emotional processing theory, exposure works by activating a "fear structure," which stores information in memory about a stimulus (e.g., snake), response to the stimulus (e.g., fight, flight, or freeze), and an interpretation of the stimulus and/or response that evokes fear (e.g., "the snake will hurt me";

"I must run away to guarantee my safety"). Once this fear structure is activated from memory through *in vivo* or imaginal exposure to the feared stimulus, incompatible information is then incorporated into the memory (e.g., "the snake is not going to hurt me"; "I will be safe if I stay in the presence of the snake"), resulting in the development of a "non-fear structure." It is theorized that with repeated exposure trials this non-fear structure will replace (Foa & Kozak, 1986), or at least compete with (Foa & McNally, 1996), the initial fear structure. During exposure trials, the integration of incompatible information that reduces the valence of the fear structure is theorized to be evidenced by both within-session and between-session habituation.

Applying emotional processing theory to eating disorders, exposure should be effective by activating a fear structure, which might consist of a feared food item (e.g., pizza), a fearful response (e.g., refusal to eat pizza), and a fearful interpretation (e.g., "if I eat pizza I will become obese"), and then incorporating incompatible information while this fear structure is activated. For example, exposure might be done by asking a patient to repeatedly eat pizza (e.g., two times per week), which would theoretically lead to the incorporation of incompatible information (e.g., "I will not become obese if I eat pizza") that replaces or competes with the initial fear structure, ultimately reducing fear and subsequent avoidance of pizza.

Despite its widespread acceptance, a growing body of research has yielded findings that are inconsistent with tenets of emotional processing theory, and suggest that habituation of fear may not be the operative process through which exposure reduces anxiety (Craske et al., 2008). Although more research is necessary, the literature thus far does not consistently support the hypothesis that higher levels of initial fear activation or greater within-session habituation during exposure therapy are associated with greater reductions of fear at follow-up. Additionally, many

participants who undergo exposure therapy report successful outcomes while failing to exhibit significant between-session habituation on physiological measures (Craske et al., 2008).

An alternative to the fear habituation model is the Pavlovian concept of inhibitory learning (Bouton, 1993; Miller & Matzel, 1988). Rather than weakening the association between a conditioned stimulus (CS) and unconditioned stimulus (US), exposure procedures may work by strengthening the *inhibitory* association between the CS and US. According to the theory of inhibitory learning, the original feared association is not extinguished through exposure, and can reemerge through various means (Craske et al., 2008), such as "spontaneous recovery" which can occur after the mere passage of time (Baum, 1988), or "renewal" which can occur upon presenting the CS in a novel context (Bouton, 1993). As inhibitory associations are more fragile and context-specific than excitatory associations (Myers & Davis, 2007), individuals may continue to experience fear at long-term follow-up even if they achieve between-session habituation of fear during exposure trials. In contrast to the fear habituation model, Craske et al. (2008) suggest that the ability to *tolerate* fear may be more important than fear reduction during exposure therapy.

Although both the fear habituation and inhibitory learning models emphasize corrective learning as the key mechanism for change and call for treatment that exposes patients to their feared stimuli, the specific approach to exposure treatment differs somewhat across these perspectives (Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014). For example, in a standard fear habituation approach to exposure therapy, patients are asked to endure an anxiety-provoking situation until their fear subsides. An inhibitory learning approach, on the other hand, places the emphasis on facilitating a mismatch between patients' expectations and experiences

during exposure trials. Consequently, reductions in patients' belief that an adverse outcome will occur would be a better indicator of when an exposure session should end than would reductions in fear. Additionally, traditional fear habituation-based exposure procedures typically start by addressing a mildly to moderately anxiety-provoking item on a fear hierarchy. Once habituation to this stimulus occurs, the next item up on the fear hierarchy is selected for exposure treatment, proceeding sequentially until habituation is achieved for all items on the fear hierarchy (Barlow & Cerny, 1988). In contrast, an inhibitory learning approach suggests that it may be more beneficial to introduce greater variability during exposure trials, such as by conducting exposure to feared items in random order and by varying the stimuli present during exposure, the duration of exposure sessions, and the level of intensity of the exposure (Craske et al., 2014). Consistent with this suggestion, increasing variability during exposure has been found to be beneficial in the long-term, despite lack of within-session habituation (Kircanski et al., 2012; Lang & Craske, 2000).

Yet another model that attempts to explain the mechanisms of exposure treatment is social learning theory, which postulates that exposure is effective by modifying cognitive processes (Bandura, 1988). In particular, the construct of *self-efficacy*, which refers to one's perception of her or his ability to cope or perform a certain behavior (Bandura & Cervone, 1983), has been theorized to be critical for psychological change (Bandura, 1977). A small body of research supports the importance of self-efficacy for behavior change in anxiety disorders. In one study, participants with a phobia of heights and those with a phobia of driving who were randomly assigned to receive a mastery-oriented exposure treatment reported significantly improved behavioral functioning, self-efficacy, and anxiety ratings relative to participants who

received traditional exposure therapy (Williams, Dooseman, & Kleifield, 1984). Moreover, perceived self-efficacy has been found to be a significantly better predictor of therapeutic outcome following exposure therapy than self-reported anxiety in participants with agoraphobia and fear of heights (Williams, Kinney, & Falbo, 1989; Williams, Turner, & Peer, 1985). One study that investigated self-efficacy throughout the course of "guided imaginal coping" found that changes in self-efficacy predicted reductions in catastrophic thinking, but not in panic symptoms (Borden, Clum, & Salmon, 1991).

Eating disorder researchers have also suggested that improving self-efficacy may be a more important treatment target than extinguishing anxiety about food and eating-related activities (e.g., Wilson, 1988). Indeed, self-efficacy has been found to be associated with reductions in binge eating and purging frequency in the treatment of BN using exposure with cognitive restructuring (Wilson, Rossiter, Kleifield, & Lindholm, 1986) and CBT (Schneider, O'Leary, and Agras, 1987). Despite improvements in reported self-efficacy, Wilson et al. (1986) found no differences in participants' heart rate, a physiological measure of fear, from pre-treatment to post-treatment. Like most research investigating self-efficacy ratings in response to exposure treatment for anxiety disorders, however, these studies assessed self-efficacy at the same time as other outcomes. Thus, it may be that self-efficacy is merely correlated with positive treatment outcomes. In view of these limited findings, more research incorporating indicators of both anxiety and self-efficacy over the course of exposure treatment is warranted.

Despite the apparent role of anxiety in eating disorders and extensive research supporting the efficacy of exposure therapy, therapist-assisted exposure is rarely conducted with eating disorder patients, and is absent from CBT manuals for eating disorders (e.g., Fairburn, 2008;

Waller et al., 2007). The lack of therapist-assisted exposure in CBT protocols for eating disorders is somewhat surprising given that exposure is the most prominent cognitive-behavioral intervention for anxiety and avoidance. In a sense, CBT protocols for eating disorders do involve exposure to feared eating and weight-related stimuli: therapists encourage their patients to eat regularly and eventually incorporate feared foods into their diets; discourage binge eating, purging, excessive exercise, and frequent weighing; and weigh patients in treatment sessions despite patient fears about this process (Fairburn, 2008; Waller et al., 2007). Unlike CBT for many anxiety disorders, however, exposure is not an integrated feature of CBT for eating disorders and is rarely therapist-assisted. With the exception of in-session weigh-ins, patients are expected to engage in "exposure" on their own.

Findings from exposure treatment for eating disorders. Although therapist-assisted exposure is not currently a central component of CBT protocols, a number of studies have investigated the efficacy of exposure treatment for eating disorders. Prior research has focused heavily on exposure and response prevention (ERP) procedures targeting binge eating (ERP-B) or purging (ERP-P) in BN. Paralleling ERP treatment for obsessive-compulsive disorder (OCD), ERP-P exposes patients to cues that elicit vomiting (such as eating foods that typically lead to an urge to purge) and prevents patients from purging until their anxiety subsides. Similarly, ERP-B procedures instruct patients to taste, smell, and touch foods that typically trigger a binge episode and concentrate on their fears and emotions, while being prevented from binge eating (Carter & Bulik, 1994). As a stand-alone treatment, ERP has been shown to reduce eating disorder symptomatology in BN (Kennedy, Katz, Neitzert, Ralevski, & Mendlowitz, 1995; Leitenberg, Gross, Peterson, & Rosen, 1984; McIntosh, Carter, Bulik, Frampton, & Joyce 2011; Rosen &

Leitenberg, 1982; Schmidt & Marks, 1988), and may be superior to cognitive restructuring alone (Rossiter & Wilson, 1985; Wilson, Rossiter, Kleifield, & Lindholm, 1986) or self-control techniques (Jansen, Broekmate, & Heymans, 1992).

Despite these positive findings, research investigating the additive efficacy of ERP to CBT has provided mixed results. While two studies found that the addition of ERP to CBT for BN resulted in improved treatment outcomes at six-month (Leitenberg, Rosen, Gross, Nudelman, & Vara, 1988) and five-year (McIntosh et al., 2011) follow-up, other studies indicated that the addition of ERP to CBT for BN failed to demonstrate any incremental benefits above and beyond CBT alone (Bulik, Sullivan, Carter, McIntosh, & Joyce 1998; Carter, McIntosh, Joyce, Sullivan, & Bulik, 2003; Wilson, Eldredge, Smith, & Niles, 1991), and may even have deleterious effects (Agras, Schneider, Arnow, Raeburn, & Telch, 1989). Another study found that CBT for BN without exposure resulted in better outcomes than ERP without cognitive restructuring at one-year follow-up (Cooper & Steere, 1995). Some researchers have concluded that the lack of strong, consistent findings supporting ERP as an additive intervention suggests that the time and effort ERP requires may not be warranted (Bulik et al., 1998).

Researchers have proposed a number of explanations for these inconsistent findings, including the variable duration and delivery of exposure across studies (Carter & Bulik, 1994). For example, while some ERP procedures avoided the use of any type of cognitive restructuring (e.g., Jansen et al., 1992), others encouraged the challenging of distorted thoughts during exposure (e.g., Rosen & Leitenberg, 1982). In some protocols, the addition of exposure resulted in fewer sessions of CBT (e.g., Wilson et al., 1986; Wilson et al., 1991) or less time in sessions devoted to the non-exposure elements of CBT (e.g., Agras et al., 1989). Additionally, exposure

sessions were often conducted in clinics or laboratories, and the beneficial effects of exposure might not generalize to the naturalistic settings where patients regularly eat such as restaurants (Koskina, Campbell, & Schmidt, 2013). As noted earlier, CBT facilitates the consumption of regular meals, reintroduction of forbidden foods, and abstinence from binging and purging (e.g., Fairburn, 2008; Garner et al., 1997), which is essentially exposure between treatment sessions (Carter & Bulik, 1994). By definition, individuals recovering from AN must be exposed to eating more food, gaining weight, and living in their heavier bodies (Murray et al., 2016; Vitousek, 2012). Thus, the elements of exposure implicit in CBT may render more explicit exposure treatment, such as ERP for binge eating or purging, unnecessary for many patients.

In addition to the body of research testing ERP for BN, several studies have examined other exposure-based elements in the treatment of AN. Two studies tested the effect of ERP as an adjunct to inpatient treatment targeting meal consumption in weight-restored patients with AN by exposing them to feared eating situations (e.g., holding and eating a sandwich) and preventing "anxiety-reducing" rituals (e.g., breaking the sandwich into small pieces; Steinglass et al., 2007; Steinglass et al., 2014). ERP resulted in modest improvements in calorie intake and anxiety. Additionally, Family Behavior Therapy with exposure (FBT-E) has yielded encouraging results (Hildebrandt, Bacow, Greif, & Flores, 2013). FBT-E incorporates exposure techniques into standard FBT for AN by creating a fear hierarchy of foods for the adolescent patient, instructing the patient's parents to incorporate these foods into meals in a graduated fashion, preventing "rituals" such as weighing food or eating slowly, and monitoring distress ratings during meals. Despite these affirmative findings, it is unclear whether the addition of an exposure component to CBT or FBT for AN significantly improves outcomes.

Exposure treatments designed to improve body image and related avoidance behaviors include mirror exposure (e.g., Hildebrandt et al., 2012), exposing patients to videos of themselves in the laboratory (e.g., Tuschen-Caffier, Voegele, Bracht, & Hilbert, 2003), and using virtual reality technology to manipulate body shape and weight (e.g., Marco, Perpiñá, & Botella, 2013; Perpiñá et al., 1999). Body image exposure has been found to improve behavioral, cognitive, and emotional indicators of body dissatisfaction, body avoidance, and other eating disorder symptoms in patients with BN (Delinsky & Wilson, 2010; Trentowska, Bender, & Tuschen-Caffier, 2013), AN (Key et al., 2002; Morgan, Lazarova, Schelhase, & Saeidi, 2014), BED (Hilbert, Tuschen-Caffier, & Vogele, 2002), and diagnostically diverse samples of eating disorder patients (Hildebrandt, Loeb, Troupe, & Delinsky, 2012; Trentowska, Svaldi, & Tuschen-Caffier, 2014; Trottier, Carter, MacDonald, McFarlane, & Olmsted, 2014; Vocks, Legenbauer, Wächter, Wucherer, & Ko, 2007). Although body image exposure has been incorporated into CBT with positive outcomes, the additive efficacy of body image exposure to CBT has yet to be tested. It may be the case that therapist-assisted exposure is unnecessary for many patients, particularly those who exhibit improved body image and reduced fear of foods from CBT alone.

The Underuse of Exposure in the Treatment of Eating Disorders

The mixed findings from research investigating the additive efficacy of exposure may have contributed to the current absence of therapist-assisted exposure in CBT manuals for eating disorders (Koskina et al., 2013). Moreover, there are a number of other likely reasons for the underuse of exposure in the eating disorder field, some of which are general to exposure treatments across disorders and some of which may be specific to this population.

Reasons for the underuse of exposure across disorders. Hesitancy to incorporate exposure into treatment is common to therapists treating the spectrum of anxiety disorders. For example, a survey of therapists who treat post-traumatic stress disorder (PTSD) found that the vast majority never used exposure with their patients, despite strong evidence for its efficacy (Becker, Zayfert, & Anderson, 2004). One practical barrier inherent in exposure treatment is that the intervention requires additional time and sometimes cost, and entails some logistical complications (Bulik et al., 1998). If a psychosocial treatment without therapist-assisted exposure is effective in treating anxiety or eating disorders, then there may be no need for challenging exposure procedures.

Findings from a survey completed by PTSD clinicians suggest other reasons why therapists might choose to omit exposure treatment, including: inadequate training in exposure (Becker et al., 2004), perceptions that exposure is not a credible intervention (Devilly & Huther, 2008), concerns that exposure will exacerbate symptoms (Frueh, Cusack, Grubaugh, Sauvageot, & Wells, 2006), and worries that exposure will increase the likelihood of treatment dropout (Cahill, Foa, Hembree, Marshall, & Nacash, 2006; Cook, Schnurr, & Foa, 2004). In reality, research suggests that exposure for PTSD is not associated with high dropout or long-term symptom exacerbation, and appears comparably acceptable to patients relative to other psychological treatments (Olatunji, Deacon, Abramowitz, 2009).

Additionally, clinicians' *own* anxieties about challenging patients may contribute to the underuse of exposure. It has been suggested that therapists, including those with a cognitive-behavioral orientation, have a tendency to avoid interventions that push for behavior change,

particularly if they elicit distress (Waller, 2009). PTSD therapists, for instance, often note that exposure is more distressing to patients than other treatments, which contributes to their decision to omit the technique (Devilly & Huther, 2008). Indeed, effective exposure requires patients to experience a temporary increase in distress. As a result, well-meaning therapists may experience anxiety about their patients' distress, and consequently avoid interventions that make their patients (and themselves) feel uncomfortable (Waller, 2009). A therapist's decision to avoid or attenuate treatment approaches that challenge patients will typically result in reduced distress for their patients (and the therapist) in the short-term, which serves to reinforce the therapist's own avoidance behaviors. In other words, anxiety on the part of the therapist may inadvertently lead to collusion with the patient at the expense of effective treatment (Waller, 2009).

Reasons for the underuse of exposure for eating disorders. In addition to concerns that therapists have about using exposure in general, issues specific to eating disorders may also inhibit its application in this clinical population.

Normative discontent – the concept that most people are dissatisfied with their bodies (Rodin, Silberstein, & Striegel-Moore, 1984) – may contribute to clinicians' avoidance of exposure when treating patients with eating disorders (Vitousek, 2012). Results from the 1998 National Health Interview Survey, a nationally representative sample of adults in the United States, found that 38% of women and 24% of men were trying to lose weight, with higher rates among individuals who are overweight or obese (Kruger, Galuska, Serdula, & Jones, 2004). Weight discrimination has increased since the 1990s (Andreyeva, Puhl, & Brownell, 2008) and messages recommending weight loss methods are pervasive, contributing to a multibillion dollar dieting industry (Atallah et al., 2014). The prevalence of body dissatisfaction, weight

discrimination, dieting behavior, and messages about weight loss appear to have made concerns about weight gain normative across industrialized countries, and many people report experiencing some type of fear or guilt after eating certain foods. Dieters in particular tend to categorize foods dichotomously as "guilt-inducing" versus "guilt free" (King, Herman, & Polivy, 1987) and indicate experiencing greater levels of fear and/or guilt for foods that they perceive as higher in fat (Gonzalez & Vitousek, 2004). Moreover, even non-restrained eaters report some fear and/or guilt about eating certain foods (Gonzalez & Vitousek, 2004; King et al., 1987). It would be naive to think that eating disorder researchers and clinicians are immune from this normative discontent. In fact, survey research indicates that eating disorder professionals are significantly more likely to have experienced an eating disorder than the general population (Barbarich, 2002; Johnston, Smethurst, & Gowers, 2005). It may be the case that therapists resonate more with the fears reported by eating disorder patients (e.g., weight gain) than those expressed by anxiety disorder patients (e.g., fears of contamination, social rejection, panic attacks, heights, etc.). In consequence, both normative discontent and personal eating disorder history may contribute to the avoidance of exposure treatment for eating disorders.

A number of other important features distinguish eating disorders from anxiety disorders. Experienced eating disorder researchers and practitioners may be familiar with these distinctive features and consequently view exposure as inappropriate for this clinical population. One noteworthy distinction, especially for individuals with AN, is the *functional* role that fear plays in facilitating the highly valued goal of weight loss (Garner & Bemis, 1982). Indeed, an intense fear of weight gain might be necessary for patients determined to resist their fierce hunger and maintain their weight loss trajectories. As a result, many AN patients will intentionally cultivate

their fears related to eating and weight, and in turn value fear itself. In contrast to those with anxiety or OCD, many individuals with AN exert effort to *maintain* their anxiety, obsessions, and/or compulsions. For example, some individuals with AN memorize slogans to sustain their fear of weight gain. The last line of the "Ana Psalm," one of many motivational messages AN individuals might rehearse to preserve fear of weight gain, states: "I will dwell in the fear of the scales forever" (p. 46, Uca, 2004). Explaining that exposure reduces fear is likely to increase treatment buy-in for patients with anxiety disorders; this rationale may have the opposite effect for those with AN (Garner & Bemis, 1982). The uniquely functional role that fear plays for certain individuals with eating disorders requires attention, as it has implications for how exposure should be framed to patients and at what point in treatment it should be implemented.

Additionally, many of the behaviors that resemble anxiety-driven avoidance in AN may be attributable to the stereotyped effects of semi-starvation that occur in all starving people (Vitousek, 2012). Prior researchers have used exposure to prevent the "anxiety-reducing rituals" of eating slowly or playing with food in patients with AN (Hildebrandt et al., 2014; Steinglass et al., 2014), and these behaviors are commonly prohibited in inpatient units for eating disorders. However, these behaviors occur across *all* starving people (Keys et al., 1950), not just those with AN. Given that stereotyped starvation behaviors can persist for months following refeeding, it may be inappropriate to use exposure to treat these behaviors, particularly in the early phases of treatment.

Unlike most anxiety disorders, the fears associated with food and weight for individuals with eating disorders are often at least partially valid (Vitousek, 2012). For patients who are maintaining their weight below their biological set point, eating regularly *will* lead to the feared

outcome of weight gain (Murray et al., 2016). Additionally, binge eating and loss of control around eating are typical responses following a period of semi-starvation (Keys et al., 1950). Patients' concerns that eating regularly will lead to out of control eating may be valid, particularly for patients with AN, and could call for the use of certain types of "safety signals" (e.g., eating no more than a predetermined amount of food) to prevent overeating during the process of recovery (Vitousek, 2012). These distinctive features do not necessarily contraindicate the use of exposure when treating eating disorders, but should be considered when implementing exposure with this clinical population (Murray et al., 2016).

The "Undershooting" of Exposure with Eating Disorders

In addition to the underuse of exposure for eating disorders relative to anxiety disorders, the way in which exposure has been conducted for eating disorders is relatively narrow in scope and conservative in approach (Vitousek, 2012). Exposure treatment for anxiety disorders often involves *overcorrection* – exposure moves beyond simply "being around" the feared stimulus to even more challenging sessions where the patient's specific fears are amplified or exaggerated (Huppert, Siev, & Kushner, 2007). For example, in the treatment of social anxiety disorder, an exposure session might involve a patient making a public speech in front of an unknown audience. An exposure session that overcorrects could do so by using a hostile, unreceptive audience during the patient's speech (e.g., Pertaub, Slater, & Barker, 2002) in order to amplify the patient's fear of negative evaluation. A parallel example of overcorrecting might be used with a patient with OCD who says "God forbid" aloud as a ritual to prevent harmful things from happening to others. As part of ERP, this patient might initially be asked to imagine a friend getting killed and be prevented from saying "God forbid." As exposure progressed, he might be

encouraged to shift to saying "God willing" out loud every time he imagines something terrible happening to a friend (Abramowitz, Franklin, & Cahill, 2004). The use of overcorrection may strengthen the efficacy of exposure treatment by increasing patient confidence in the non-occurrence of a feared consequence and reduce the likelihood of relapse (Huppert & Siev, 2010).

In contrast, exposure for eating disorders typically "undershoots," and has seldom challenged patients to do more than eat feared foods or view themselves in a mirror for an extended period of time. By adopting the principle of overcorrection sometimes employed in the treatment of anxiety disorders, therapists have the potential to use exposure in imaginative ways to address a wide range of situations related to eating, weight, and shape that patients fear and avoid. There are some indications that scientist-practitioners are beginning to explore creative adaptations of exposure for eating disorders. Levinson, Rapp, and Riley (2014) recently described using challenging imaginal exposure sessions to overcorrect for fear of becoming fat, Glasofer, Albano, Simpson, and Steinglass (2016) conducted exposure sessions targeting feared situations such as portioning food out of a larger container, and Trottier et al. (2015) encouraged patients to engage in challenging between-session exposures including eating a high energy food in front of a romantic interest. These studies represent the most challenging adaptations of exposure in the eating disorder literature, yet none of them utilized the principle of "overcorrection" to the same degree as exposure treatment for anxiety disorders. Examples of particularly challenging therapist-assisted exposure sessions for eating disorder patients desgined to overcorrect include a patient eating a regular-sized meal while a therapist orders a traditional "diet" meal (e.g., a small salad), or a therapist criticizing a patient's meal (e.g., "I'm surprised that you are eating something that has so many calories"). To date, no published study in the

eating disorder field has described or tested therapist-assisted exposure in this manner.

Using Exposure to Support "Full Recovery"

A possible benefit of exposure for eating disorders is its potential to prevent relapse and support full recovery. Estimates indicate that over one-third of women who recover from AN or BN subsequently relapse (e.g., Carter et al., 2012; Halmi et al., 2002; Keel, Dorer, Franko, Jackson, & Herzog, 2005). During and after treatment, patients who are at higher risk for relapse have been found to exhibit: decreased motivation to recover, slower response to treatment, shorter periods of abstinence during treatment, increased body dissatisfaction, higher levels of preoccupation and ritualization of eating, more weight-related self-evaluation, increased residual symptoms (e.g., binging, vomiting, calorie restriction), and poorer psychosocial functioning (e.g., Carter et al., 2012; Freeman, Beach, Davis, & Solyom, 1985; Halmi et al., 2002; Keel et al., 2005; McFarlane, Olmsted, & Trottier, 2008; Olmsted, MacDonald, McFarlane, Trottier, & Colton, 2015). In other words, patients who no longer meet diagnostic criteria for an eating disorder but continue to experience residual behavioral and/or cognitive symptoms appear to be at higher risk of relapse following treatment.

In addition to higher rates of relapse, patients who do not demonstrate full recovery from both the behavioral and cognitive features of eating disorders may continue to experience psychological difficulties. Bardone-Cone et al. (2010) posit that: "full recovery is achieved when individuals with a history of an eating disorder appear indistinguishable from healthy controls (defined as having no history of an eating disorder) on indices reflecting behavioral and psychological aspects of eating disorders" (p. 195). Bardone-Cone et al. (2010) operationally defined "full recovery" as scoring within one standard deviation of age-matched community

norms on the Restraint, Eating Concern, Weight Concern, and Shape Concern subscales of the Eating Disorder Examination-Questionnaire (Fairbrun & Beglin, 1994). On all other domains, the fully recovered and partially recovered groups were defined in the same way: individuals in both groups no longer met diagnostic criteria for an eating disorder, maintained a Body Mass Index (BMI) of at least 18.5 kg/m^2, and abstained from binge eating, purging, or fasting over the past three months. Compared to the fully recovered group, individuals who achieved partial recovery reported more disordered eating cognitions, poorer body image, higher incidence of a mood disorder, and increased difficulties with psychosocial functioning in certain domains (Bardone-Cone et al., 2010). It may be the case that CBT's effectiveness is constrained by terminating treatment before patients have achieved a sufficient level of recovery and by an inadequate focus on the full spectrum of psychological symptoms experienced by patients with eating disorders. Adding elements to CBT that better facilitate full recovery (e.g., normal levels of body satisfaction, restraint, eating behaviors, weight concerns, etc.) may be one of the keys to improving treatment for eating disorders.

Therapist-assisted exposure may provide therapists with an intervention that fosters full recovery, and may be particularly useful after patients have recovered from the behavioral symptoms of an eating disorder. Exposure sessions occurring later in treatment might focus on a patient's ritualized eating, body dissatisfaction, and weight-related self-evaluation. Therapist-assisted exposure might also reduce fear of *social situations* related to eating, weight, and shape, an understudied feature of eating disorders. Even after patients improve, many experience difficulties in social situations related to eating, weight, and shape, which may predispose them to relapse. Given that recovered patients will encounter a variety of eating-related social

situations after ending treatment, therapist-assisted exposure targeting highly distressing social situations may be effective in supporting full recovery from an eating disorder.

In summary, exposure can be used to target a wide range of issues that eating disorder patients frequently experience, including: binge eating, purging, fear and avoidance of certain foods and eating settings, body image, dietary rules and rituals, and social situations related to eating, weight, and shape. As eating disorder patients across diagnostic categories can experience a number of these difficulties, the type of exposure sessions conducted will vary according to the specific characteristics of the patient. In general, exposure sessions implemented earlier in treatment with BN patients are more likely to focus on eating foods that would typically trigger a binge or purge episode, earlier exposure sessions with BED patients are more likely to focus on foods that would trigger a binge episode, and earlier exposure sessions with restrictive AN patients are more likely to focus on feared and avoided foods. On the other hand, eating disorder patients within the same diagnostic group improve at different rates across various domains. The specific difficulties that a patient experiences throughout the course of treatment, rather than the patient's diagnostic category, provide a better guide to the content of exposure sessions.

Advantages of Single-Case Experimental Designs

No study to date has investigated the efficacy of therapist-assisted, *in vivo* exposure (IVE) for reducing anxiety or increasing self-efficacy about a range of eating-, weight-, and shape-related situations in patients with eating disorders. IVE was designed as an intervention that may have added benefits to CBT, not as a stand-alone treatment for eating disorders. Given the preliminary nature of this inquiry and the complexity of investigating the efficacy of an

additive element to a larger treatment package, a single-case experimental design appears to be a fitting approach. Single-case research involves the systematic and detailed investigation of a single subject, or small group of subjects, to study a specific phenomenon. Through the controlled variation of a clearly specified independent variable and repeated assessment of the dependent variable(s), single-case experimental designs allow researchers to make inferences about the causal relationship between an intervention and certain outcomes (Nock, Michel, & Photos, 2008). By exploring causality with a small sample, this methodological approach serves as a more affordable alternative to larger-scale between-group designs such as randomized controlled trials (RCTs; Kazdin, 2001), which may eventually be warranted to make more certain conclusions about the efficacy of IVE.

The increased flexibility afforded by single-case experimental designs is another advantage (Nock et al., 2008) that makes this an appropriate methodological approach. Paralleling the flexible use of IVE in clinical practice, a single-case design allows the timing, frequency, and content of IVE sessions to be individualized to each participant, while simultaneously maintaining the scientific rigor needed to infer causality. Attempting to establish pre-determined times when IVE sessions would occur (e.g., after five weeks of treatment, between sessions 10 and 11) is unnecessary to maintain the integrity of single-case experimental designs, and is inconsistent with clinical practice. Eating disorder patients demonstrate substantial variation in the extent to which they reintroduce feared foods into their diet, eliminate self-imposed dietary rules and rituals, increase body satisfaction, and participate in anxiety-provoking eating-related social situations and settings. Accordingly, the timing of IVE sessions will also vary for each patient, in addition to the frequency, difficulty, and content of exposure.

Additionally, single-case experimental designs have the advantage of providing information about *how* and *why* individuals improve by evaluating changes in dependent variables over the course of treatment. Change processes are more difficult to examine in RCTs, which collect data at limited time points, such as pre-treatment and post-treatment (Nock et al., 2008). Through the use of this time-series methodology, the efficacy of IVE as an additive element to CBT can be examined in specific ways that could not be done by conducting an RCT that, for example, compared outcomes of participants randomized to either a "CBT with IVE" or "CBT without IVE" condition.

The Present Study

The present study employed a multiple-baseline design across behaviors (Hayes, Barlow, & Nelson-Gray, 1999) to examine the relationship between IVE and self-reported distress about certain foods and eating, weight, and shape situations. In addition to the primary outcome of self-reported distress, self-efficacy ratings in response to IVE were also examined, particularly in view of the hypothesis that self-efficacy may be more important for recovery than extinguishing anxiety (Wilson, 1988). Participants were five patients receiving treatment services at the Center for Cognitive Behavior Therapy – Eating Disorders Clinic (CCBT-ED), an outpatient research and training clinic at the University of Hawai‘i at Mānoa that specializes in the treatment of eating disorders. For each participant, IVE was introduced as clinically indicated at various time points throughout treatment. IVE sessions targeted one or more specific anxiety-provoking stimuli. According to the logic of a multiple-baseline design across behaviors, causality can be inferred if there is a change in the specified behavior and no change in other behaviors after introducing an intervention targeting the specified behavior (Nock et al., 2008).

As noted earlier, single-case experimental designs provide scientists and practitioners with a methodological approach that investigates cause-and-effect relationships without requiring significant modifications to clinical practice. By using a multiple-baseline design across behaviors, the relationship between IVE and the outcomes of self-reported distress and self-efficacy about food and eating, weight, and shape situations was investigated by making relatively minor adjustments to treatment as usual at the CCBT-ED. Indeed, the primary difference for eating disorder patients who consented to take part in the present study and patients who did not participate was the frequency of data collection: patients who participated were asked to provide data on a more frequent basis than those who did not.

The present study also diverged slightly from typical treatment at the CCBT-ED by requiring a two-week delay between formulating and conducting IVE sessions for participants. It is worth noting, however, that the scheduling of IVE sessions, which involves planning the details of the session and identifying an available time and date for both the patient and IVE therapist, often results in a natural delay of one to two weeks. Thus, the minimum delay of two weeks in the present study parallels the natural delay likely to occur in most instances.

Additionally, ongoing data collection may have led therapists to more readily identify foods and/or situations that their patients reported as highly distressing. As a result, therapists might have chosen to implement an IVE session targeting persistently high fear ratings for a specific variable, which may not have been salient in the absence of frequent assessment.

Hypotheses

The specific hypotheses of the present study included:

1. Participants will report reduced distress for *targeted* foods and eating, weight, and

shape scenarios in the CBT sessions following each IVE session relative to the CBT sessions before each IVE

2. Participants will *not* report reduced distress for *unrelated* foods and eating, weight, and shape scenarios in the CBT sessions following each IVE session relative to the CBT sessions before each IVE
3. Participants will report increased self-efficacy for *targeted* foods and eating, weight, and shape scenarios in the CBT sessions following each IVE session relative to the CBT sessions before each IVE
4. Participants will *not* report increased self-efficacy for *unrelated* foods and eating, weight, and shape scenarios in the CBT sessions following each IVE session relative to the CBT sessions before each IVE

In addition to testing these hypotheses, data from therapists and participants were used to conduct preliminary explorations of patterns of change in distress and self-efficacy ratings over time, of each participant's reaction to IVE, and of the extent to which the effects of IVE for targeted domains generalize to other domains not targeted by exposure.

Method

Measures

CCBT-ED intake interview. The CCBT-ED intake interview is a semi-structured interview developed by staff at the CCBT-ED. The interview was designed to obtain a detailed history of the patient's eating and weight concerns, the nature of the eating disorder and related symptoms that inform diagnosis according to DSM-5 criteria (American Psychiatric Association, 2013), and relevant psychological, social, and physiological history. The CCBT-ED intake interview assesses food restriction and avoidance, binge eating, purging, exercise, and other compensatory behaviors; history of eating and weight concerns; body image; frequency of self-weighing; history of eating disorder-related medical complications; history of psychiatric difficulties, diagnoses, and/or hospitalizations; past and present suicidality; experiences with psychological treatment and medication; family circumstances, current living situation, and employment; and motivation for treatment.

CCBT-ED background questionnaire. The CCBT-ED background questionnaire is a 10 page measure that assesses a number of demographic variables, including sex, ethnicity, age, religious affiliation, and marital status. The questionnaire also asks participants to provide information about their living situation, family background, weight history, dieting history, exercise regimen, psychiatric history, drug use, sexual behaviors, medical issues, menstrual history, and professional background.

Food Phobia Survey (FPS). The FPS is a 180-item questionnaire designed to facilitate the identification of foods that are desired but avoided by patients with eating disorders due to fear or guilt (Gonzalez & Vitousek, 2004; see Appendix A). The measure asks participants to

indicate on a 5-point Likert scale the frequency within the last year with which they have eaten each food (from *Never* to *Very Often*), the extent to which they have feared and/or felt guilty about each food (from *None* to *Very Strong*), and how desirable or appealing they find each food independent from other considerations such as perceived healthfulness, dangerousness, and fat content (from *Not At All* to *Extremely*). The FPS demonstrated high test-retest reliability for the number of foods designated as feared by female undergraduates, and discriminated between dieters and non-dieters (Gonzalez & Vitousek, 2004).

Given that no published study has examined the psychometric properties of the FPS among individuals with eating disorders, a preliminary assessment of the scale's validity was conducted for the present investigation. Of 56 female patients who were administered the FPS while being assessed at the CCBT-ED, 53 also completed the EDI-2 and 25 were screened with the Eating Disorder Examination (EDE). The sample was 76.1% Caucasian, 19.6% Asian, and 19.6% mixed ethnicities, with a mean age of 25.0 (SD = 11.63) years. Criterion-related validity was assessed by examining the extent to which the FPS was correlated with subscales from the EDE and the EDI-2 measuring similar constructs: the Restraint, Eating Concern, and Weight Concern subscales of the EDE, and the Drive for Thinness subscale of the EDI-2. Construct validity was measured using the "known groups" method by comparing the mean number of avoided foods identified by the FPS in the present sample to the mean previously collected in a non-clinical sample. Consistent with previous interpretations of the measure (Gonzalez & Vitousek, 2004), forbidden foods were defined as foods that were: (a) rated a 1 or 2 for frequency of consumption; (b) rated as a 4 or 5 for associated fear/guilt; and (c) rated as a 4 or 5 for appeal.

As anticipated, the number of forbidden foods identified by the FPS was significantly correlated with the Restraint ($r = .72$, $p < .001$), Eating Concern ($r = .45$, $p < .05$), and Weight Concern ($r = .55$, $p < .01$) subscales of the EDE, and the Drive for Thinness ($r = .52$, $p < .001$) subscale of the EDI-2. Additionally, the FPS identified a significantly greater number of forbidden foods in the eating disorder sample than in the non-clinical sample ($t = 3.72$, $p < .001$). These results provide preliminary psychometric evidence supporting the validity of the FPS in a sample of patients with eating disorders.

IVE Scenarios Scale (IVESS). The IVESS is a 29-item self-report questionnaire that was developed for the present study (see Appendix B). Paralleling the format of fear hierarchies utilized in exposure treatment for anxiety (Wolpe & Lazarus, 1966), the IVESS asks participants to imagine a number of eating-, weight-, and shape-related scenarios and to rate how distressing each situation would be on a 100-point scale (with 0 representing no distress and 100 representing the most distress imaginable). Items include scenarios from four different domains: (1) eating settings, (2) eating-related social situations, (3) dietary rules and rituals, and (4) body image situations. Participants were also able to write in other relevant feared scenarios not included on the IVESS.

The investigator and seven other graduate students working at the CCBT-ED under the supervision of Dr. Kelly Vitousek, the clinical researcher who developed this approach to IVE for eating disorders, initially generated a pool of prospective items for the IVESS. Therapists were asked to describe all IVE sessions that they had conducted or remembered being discussed during clinical supervision. The investigator compiled these items into a longer list of IVE scenarios and removed or revised redundant items. Subsequently, Dr. Vitousek reviewed the list

and suggested the addition, removal, and modification of certain items. Seven CCBT-ED staff members were then asked to evaluate the test instructions and items for breadth, quality, clarity, wording, and appropriateness for patients with eating disorders. Written and verbal feedback from CCBT-ED staff members was used to make further decisions about the inclusion and wording of the items and instructions, ultimately resulting in a final version of the IVESS for the present study.

Subjective units of distress (SUDS) scale. The SUDS scale (Wolpe & Lazarus, 1966) is a self-report measure that is commonly used to assess subjective distress in individuals with anxiety disorders, and has been used in exposure treatment for eating disorders (e.g., Gray & Hoage, 1990; Hildebrandt et al., 2013; Steinglass et al., 2014). Typically, a therapist works with a patient to generate a list of distressing scenarios related to a feared domain. The patient then rates each scenario on a scale from 0 to 100, with 0 representing no distress and 100 representing the maximum level of distress. A number of these scenarios are then placed into a fear hierarchy, ordered from lowest to highest according to their anticipated SUDS rating. SUDS have been found to be significantly associated with other self-report measures of anxiety such as the Multiple Affect Adjective Check List and the State-Trait Anxiety Inventory (Kaplan, Smith, & Coons, 1995), clinicians' ratings of patients' general functioning (Tanner, 2012), and physiological indicators of distress such as heart rate and digit temperature (Thyer, Papsdorf, Davis, & Val, 1984).

While some adult patients with social anxiety disorder exhibit relatively static reductions in SUDS during exposure sessions, others report substantial within-session variation in SUDS (Hayes, Hope, & Heimberg, 2008). In two single-subject designs investigating exposure

treatment for children with choking phobia, patients exhibited moderately fixed reductions in distress ratings between treatment sessions when averaging SUDS across several different food items (Chorpita, Vitali, & Barlow, 1997; Scemes, Wielenska, Savoia, & Bernik, 2009). A generally steady decreasing trend in SUDS between sessions was also found across four children in a multiple-baseline design evaluating parent-assisted ERP for OCD when averaging the items on fear hierarchies (Knox, Albano, & Barlow, 1996). Similarly, relatively stable SUDS ratings have been observed during the baseline phase of a single-subject design evaluating flooding for an adult female with a phobia of public transportation (Hayes & Barlow, 1977).

A small number of studies suggest that individuals with eating disorders may exhibit greater variability in distress ratings over time relative to patients with anxiety disorders. Individuals with eating disorders commonly report *higher* SUDS during and after exposure sessions targeting feared foods (Boutelle, 1998; Carter, Bulik, McIntosh, & Joyce, 2002), which tend to progressively reduce over the two hours following the exposure (Gray & Hoage, 1990).

Self-efficacy ratings. Similar to the self-efficacy scales developed by Bandura, Taylor, Williams, Mefford, and Barchas (1985), the present study measured self-efficacy by asking participants to rate how certain they were that they could handle eating particular foods or participating in certain situations on a scale from 0 (*highly uncertain*) to 100 (*completely certain*). Self-efficacy ratings have been found to be associated with positive therapeutic outcome (Williams, 1992), reduced anxiety and avoidance (Jones & Menzies, 2000), better behavioral performance in exposure trials (Zoellner, Echiverri, Craske, 2000), reduced physiological indicators of stress (Bandura et al., 1985), and improvements in the immune system (Wiedenfeld et al., 1990).

Eating Disorder Examination – Self-Report Questionnaire Version (EDE-Q). The EDE-Q (Fairburn & Beglin, 2008) is a self-report version of the widely used EDE (Fairburn & Cooper, 1993). The EDE-Q consists of 4 subscales measuring the cognitive features of eating disorders over the past 28 days: Restraint, Eating Concern, Shape Concern, and Weight Concern. In addition, the EDE-Q assesses the behavioral symptoms of eating disorders, including frequency of binge eating, self-induced vomiting, laxative use, and "compulsive" exercise. Test-retest reliability of the EDE-Q has been evaluated in a sample of undergraduate women (Luce & Crowther, 1999) and a sample of men and women seeking treatment for BED (Reas, Grilo, & Masheb, 2006). With the exception of subjective binge episodes, test-retest coefficients ranged from 0.51 to 0.94 for the various subscales and behavioral frequency items (Berg, Peterson, Frazier, & Crow, 2012). The EDE-Q has also demonstrated acceptable internal consistency across four studies, adequately detected differences between eating disorder and control groups in four studies, and converged with instruments measuring similar constructs and daily food records in three studies (Berg et al., 2012).

Body Shape Questionnaire – 8-Item Version (BSQ-8). The BSQ-8 (Evans & Dolan, 1993) is a shortened version of the lengthier 34-item self-report measure of body dissatisfaction developed by Cooper, Taylor, Cooper, and Fairburn (1987). Four different versions of the BSQ-8 demonstrated good internal consistency in a nonclinical female sample, with alpha values ranging from .87 to .92 (Evans & Dolan, 1993). Additionally, the four versions of the BSQ-8 exhibited virtually identical convergent and divergent validity as a 16-item version of the scale. One of the four versions of the BSQ-8 demonstrated the most sensitivity to change in a sample of BN patients who completed the measure before receiving therapy and after six weeks of CBT

(Pook, Tuschen-Caffier, & Brähler, 2008), and was the version selected for the present study. The BSQ has demonstrated: good concurrent and discriminant validity in a community sample of young women and in patients with BN (Cooper et al. 1987); good test-retest reliability, concurrent validity with other measure of body image, and criterion validity in a nonclinical sample of college students, obese individuals seeking weight reduction, and clinical subjects referred for body image difficulties (Rosen, Jones, Ramirez, & Waxman, 1996); and sensitivity to change in women receiving CBT for BN (Pook & Tuschen-Caffier, 2004).

Fear of Food Measure (FOFM). The FOFM is a 23-item self-report instrument designed to assess changes in anxiety and avoidance behaviors in eating disorder patients following exposure treatment (Levinson & Byrne, 2014). The FOFM has three subscales: (1) "Anxiety about Eating," which was designed to measure trait level fear of food and anxiety about eating; (2) "Food Avoidance Behaviors," which was designed to measure the anxiety-related avoidance behaviors commonly observed in individuals with eating disorders; and (3) "Feared Concerns," which was designed to measure the maladaptive thoughts and core beliefs associated with food anxiety. The FOFM exhibited a good three-factor structure and convergent and divergent validity in two samples consisting of undergraduate females and women in the community (Levinson & Byrne, 2014). Individuals diagnosed with an eating disorder exhibited higher scores on the FOFM than matched controls. Additionally, the FOFM was associated with food intake and anxiety during an exposure meal and significantly decreased over the course of four exposure sessions in a clinical sample of patients with eating disorders (Levinson & Byrne, 2014).

IVE Feedback Form. To obtain more global and open-ended information about participants' experiences with IVE sessions, the IVE Feedback Form was created (see Appendix C). This measure includes four Likert-type items asking participants to rate the utility of IVE sessions on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*) and four open-ended questions about participants' experiences with IVE. This measure was administered several weeks after participants completed their final IVE session, typically at the end of treatment.

CCBT-ED Therapist Checklist. To track the specific CBT interventions employed during each treatment session, a checklist delineating a number of different possible interventions was created for the present study (see Appendix D). The CCBT-ED Therapist Checklist instructs therapists to endorse which interventions were implemented during each treatment session. The specific interventions are organized into eight general categories: (1) Psychoeducation and Treatment Rationale, (2) Enhancing Motivation and Specific Strategic Techniques, (3) In-Session Weighing, (4) Self-Monitoring, Meal Planning, and Interrupting the Binge-Purge Cycle, (5) Cognitive Interventions Addressing Eating, Weight, and Shape Concerns, (6) Behavioral Interventions Addressing Eating, Weight, and Shape Concerns, (7) Cognitive and Behavioral Interventions Addressing Concerns other than Eating, Weight, and Shape, and (8) Relapse Prevention. The CCBT-ED Therapist Checklist also directs therapists to document the patient's weight and note the number of times the patient reported engaging in objective binges, subjective binges, and purging episodes since the last treatment session. The CCBT-ED Therapist Checklist was created by the investigator and reviewed by the clinical supervisor and seven other graduate students at the CCBT-ED. Ongoing feedback from CCBT-ED staff resulted in additional revisions to the instrument.

IVE Form. To record the details of each IVE session, an IVE Form was created for the present study (see Appendix E). The primary investigator completed the front side of each IVE Form when discussing details of an upcoming IVE session with the clinical supervisor and primary therapist(s). The front side of each IVE Form was completed at least two weeks before the scheduled IVE session, and includes: the date when the IVE session was initially formulated, the specific item(s) on the participant's fear hierarchies that the IVE aims to address, the foods and/or scenarios that might be expected to demonstrate generalization effects from the IVE, the foods and/or scenarios that are *not* expected to demonstrate generalization effects from the IVE, and a description of the decision-making process that occurred when setting up the IVE. The IVE therapist completed the back side of this form after each IVE session. The back of the IVE Form includes information about the date of the IVE session, the content and length of the IVE session, and the participant's SUDS ratings before, during, and after the exposure. The investigator obtained feedback about the measure from the clinical supervisor and seven other graduate students at the CCBT-ED and made revisions accordingly.

Procedure

Intake protocol. Referrals to the CCBT-ED usually come from the university's counseling and student development center, medical and mental health providers in the community, or by self-referral for individuals who become aware of the clinic through flyers, brochures, or the clinic's website. The CCBT-ED clinic typically has a caseload of approximately eight patients at any given time. Unfortunately, the CCBT-ED had a lower patient census during the time of data collection for the present study, with a caseload of five patients or fewer throughout this period. Consistent with past recruitment strategies at times of

low patient flow, the investigator placed flyers and/or brochures detailing the clinic's services around the University of Hawai'i at Mānoa's campus and the city of Honolulu, and contacted high school counselors in Honolulu to provide information about the clinic's services. Regrettably, these recruitment approaches did not contribute to the attainment of any additional study participants.

Prior to scheduling an appointment with the CCBT-ED, all participants completed a phone screen conducted by one of the clinic's therapists. Therapists at the CCBT-ED were master's or doctoral students in the Clinical Studies Program at the University of Hawai'i at Mānoa who were enrolled in the CCBT-ED clinical practicum. All interested patients who completed a phone screen during the time of the current evaluation were considered eligible for an assessment at the CCBT-ED. After acquiring the patient's consent, one to two CCBT-ED therapists conducted an assessment which included: administration of the CCBT-ED intake interview; measuring the patient's height and weight; completion of the CCBT-ED background questionnaire, EDE-Q, BSQ-8, FOFM, FPS, IVESS, and other clinic measures; providing feedback to the patient about her condition, including any relevant DSM-5 diagnoses; and a discussion of treatment options. Additionally, therapists obtained consent and discussed treatment options with the parents of the two patients who were below the age of 18.

During the final assessment session, the therapist(s) who conducted the evaluation provided patients (and, for the two minors, their legal guardians) with information about the current investigation and reviewed an Institutional Review Board-approved consent form (see Appendix F and Appendix G). An assent form was reviewed with and signed by the two participants under the age of 18 (see Appendix H). All patients assessed at the CCBT-ED during

data collection were deemed eligible for treatment and consented to participate in the present study. No patient refused to participate or dropped out of the study. Assessment and treatment were provided at no cost to participants.

CBT protocol. CBT was provided by clinic therapists, who were graduate students who had received at least one year of specialized training in CBT and eating disorders. This training is conducted by Dr. Vitousek and consists of attendance in clinical supervision at the CCBT-ED, participation in ongoing didactic presentations relevant to eating disorders, and completion of at least one university seminar course in CBT. All clinic therapists received ongoing weekly supervision from Dr. Vitousek, who is an expert in the field of eating disorders and one of the first researchers to adapt CBT for AN (Garner & Bemis, 1982). In contrast to clinical trials evaluating CBT for eating disorders (e.g., Fairburn, 2008), treatment at the CCBT-ED does not involve a pre-determined sequence of interventions or set number of sessions. Paralleling the way that CBT is typically conducted in clinical practice, treatment entailed the flexible use of cognitive, behavioral, and motivational approaches. Patients received an average of one to two CBT sessions per week.

Rather than adhering to a specific treatment manual, therapists at the CCBT-ED treated patients using behavioral, cognitive, and motivational interventions as informed by manuals and articles describing CBT for eating disorder (e.g., Garner et al., 1997; Fairburn, 2008; Waller et al., 2007) under the supervision of Dr. Vitousek. The specific cognitive-behavioral interventions implemented by therapists at the CCBT-ED fall under eight general domains: (1) Psychoeducation and Treatment Rationale, (2) Enhancing Motivation, (3) In-Session Weighing, (4) Self-Monitoring, Meal Planning, and Interrupting the Binge-Purge Cycle, (5) Cognitive

Interventions Addressing Concerns Related to Eating, Weight, and Shape, (6) Behavioral Interventions Addressing Concerns Related to Eating, Weight, and Shape, (7) Interventions for Comorbid Difficulties, and (8) Relapse Prevention. The IVE Form (see Appendix E) includes a list of specific interventions within each of these eight domains. Throughout all aspects of treatment, therapists also implemented basic CBT elements, including: setting and maintaining an agenda, Socratic questioning, identifying treatment goals, conducting joint reviews of progress, assigning homework, building a positive therapeutic alliance, being empathetic and validating, taking an experimental approach to treatment, and encouraging the patient to become her or his own therapist (Waller et al., 2007; Vitousek et al., 1998).

IVE protocol. IVE therapists were graduate students enrolled in the CCBT-ED practicum. With the exception of Participant 4's IVE session, all patients met with a different provider from their primary therapist for IVE sessions. The frequency and timing of IVE sessions varied by patient, depending on when it was deemed clinically indicated to target a specified eating, weight, or shape scenario.

Exposure therapists adhered to an IVE protocol created by Dr. Vitousek. Each IVE session had a predetermined purpose that was apparent to both the therapist and patient. In order to facilitate natural eating situations, all but one of the sessions occurred in real-world settings such as restaurants. The specific details of each IVE were established collaboratively between the patient and therapist in prior CBT sessions. After discussing the details and goals of the exposure session with the patient, the primary therapist communicated all relevant information to the IVE therapist.

At the start of each exposure session, the IVE therapist confirmed the details of the

session with the patient, including where they would be going, what each would be eating, and other specifics relevant to the session. IVE therapists also inquired about the patient's predictions for how the session will go, and obtained SUDS ratings before, throughout, and after the IVE session. In order to model appropriate social eating behavior while simultaneously encouraging the patient to persist through an anxiety-provoking situation, IVE therapists were trained to use an interactive style that is somewhere between social and conventionally therapeutic. In general, discussions during IVE sessions are similar to conversations one might have with someone she or he recently met, and often involved a substantial amount of "small talk."

Duration varied across exposure sessions, with an average length of approximately 60 minutes. At the end of each session, the IVE therapist debriefed with the patient, which included a discussion of the accuracy of the predictions made before the exposure, aspects of the session that went particularly well or poorly, anticipated reactions over the next several hours, and confidence in ability to adhere to the meal plan for the rest of the day. Additionally, the IVE therapist typically congratulated the patient on completing the exposure session. A more detailed debriefing of the exposure session occurred with the primary therapist during the patient's next CBT session.

At some point before the first IVE, the primary therapist(s) and patient discussed strategies for maintaining confidentiality during the exposure session, and subsequently relayed this information to the IVE therapist. Consistent with recommendations from other clinical psychologists (Olatunji et al., 2009), the primary therapist(s) and patient decided to implement one or more strategies to protect patient confidentiality during IVE sessions. It is common for

patients to choose a "cover story" to explain their relationship with the IVE therapist in case either party encounters acquaintances during the exposure session. For instance, the patient may ask the IVE therapist to introduce herself or himself to acquaintances as a friend, colleague, relative, or tutor. The IVE therapist also works to be inconspicuous when doing anything that might "out" the patient or IVE therapist to others. IVE therapists typically asked for SUDS ratings or checked on the patient's anxiety in subtle ways that would not appear out of context to others in the setting. The patient and IVE therapist sometimes developed "codes" for certain clinical questions and answers (e.g., asking "How are you feeling now?" rather than "What is your distress rating now?").

Assessment protocol. Following the patient's completion of the FPS during the assessment phase, the investigator identified all items on the measure that met criteria as a "forbidden food" (Gonzalez & Vitousek, 2004) and placed these foods on an *extensive food hierarchy*. Before or shortly after her first CBT session, the patient was asked to complete this extensive food hierarchy by rating each food item on a scale from 0 (no distress) to 100 (most distress imaginable). Patients were asked to complete the extensive food hierarchy and IVESS approximately every six weeks. Through repeated administration of these two measures, all forbidden foods and eating, weight, and shape scenarios were assessed at regular intervals throughout treatment.

Given that patients may provide inaccurate or incomplete information to clinicians, especially at the start of treatment, provisions were made in the protocol to allow for the re-administration of the FPS as warranted. Inaccurate self-reporting appears particularly likely among patients with AN, who may conceal and/or downplay their symptoms from others

(Vitousek, Daly, & Heiser, 1991), deny the severity of their symptoms to themselves (Vitousek & Strumpf, 2005), or over-represent what they are eating in their food records during treatment (Wilson & Vitousek, 1999); at low weight, some may also experience starvation-related impairment in thought content and abstraction (Keys et al., 1950). Although typically less invested in maintaining their symptoms, some patients with BN value dieting and purging as methods of weight control (Vitousek et al., 1998) and may consequently conceal information from therapists. BN individuals may also deny and/or underreport symptoms due to feelings of shame (Vitousek et al., 1991). Although there is reason to doubt the accuracy of self-report data collected from at least one participant in the present study with an atypical AN diagnosis, there were no indications that patients were being dishonest about the severity of their symptoms at intake, and thus the FPS was not re-administered to any study participant.

Several weeks before each participant's first IVE session was scheduled to occur, the investigator, therapist, and clinical supervisor worked together to create two shorter fear hierarchies for each participant. The *short food hierarchy* consisted of at least five items from the extensive food hierarchy (see Appendix I for a sample short food hierarchy), while the *short scenario hierarchy* consisted of at least five eating, weight, and shape scenarios from the IVESS (see Appendix J for a sample short scenario hierarchy). For the short food hierarchy, the investigator, therapist, and clinical supervisor identified at least five foods from the extensive food hierarchy with some of the highest SUDS ratings that appeared to be potential targets for IVE. Similarly, the five or more items selected from the IVESS for the short scenario hierarchy consisted of those rated as most distressing and address a broad range of scenarios, including eating settings, social situations, dietary rules and rituals, and body image situations.

For the several weeks before and after each IVE session, participants were given the short food hierarchy and the short scenario hierarchy at each CBT session and asked to rate each item. The SUDS and self-efficacy ratings of these items were tracked at a number of CBT sessions before and after each IVE session. As IVE did not entail gradual exposure from the lowest feared items to the highest feared items, the foods and scenarios on the short fear hierarchies were placed in random order rather than being ordered by SUDS ratings.

Ratings from fear hierarchies were obtained at the start of each CBT session to increase confidence that any changes in SUDS and self-efficacy were attributable to mechanisms initiated prior to the CBT session. Additionally, the short fear hierarchies were administered during CBT sessions, rather than IVE sessions, to investigate long-term habituation. Changes in SUDS ratings within IVE sessions were also assessed to explore the relationship between within-session reductions in anxiety and between-session habituation (Foa & Kozak, 1986). IVE therapists tracked SUDS ratings at least once before, during, and after each IVE. The IVE therapist documented these ratings on the IVE Form following each exposure session.

In addition to the foods and scenarios tracked before the first IVE session, other items were added to the short fear hierarchies at later points. Foods and scenarios that continued to be highly distressing as treatment proceeded were considered especially good candidates for IVE sessions. Thus, at different points throughout treatment, food items from the extensive food hierarchy were added to the short food hierarchy and scenarios from the IVESS were added to the short scenario hierarchy.

Following every CBT session, the primary therapist(s) completed the CCBT-ED therapist checklist indicating which CBT interventions were implemented. To assess treatment integrity,

Perepletchikova and Kazdin (2005) recommend that multiple treatment sessions be randomly observed and analyzed from each phase of treatment. Consistent with this guideline, the principal investigator randomly selected one audio recording from every ten CBT sessions for each participant. One audio recording was randomly selected from CBT sessions 1 – 10, a second from CBT sessions 11 – 20, a third from CBT sessions 21 – 30, and so on until the final treatment session. While listening to each audio recording, the principal investigator completed a CCBT-ED therapist checklist for the session. These investigator-rated checklists were then compared to those completed by the primary therapist(s) to assess for interrater reliability. The primary therapists also used the CCBT-ED therapist checklist to track the frequency of subjective binge, objective binge, and purging episodes reported by the participant at every session.

Figure 1 provides a simplified illustration of the present study's assessment protocol and design. The graph represents SUDS for six variables as rated by one hypothetical participant throughout 40 sessions of CBT. Three of these variables, labeled as letters, represent three feared foods. The other three variables, labeled as numbers, represent three feared eating, weight, and shape scenarios. The x-axis represents the number of days the participant has been receiving services at the CCBT-ED since completing the IVESS and/or extensive food hierarchy. The vertical dashed lines indicate when an IVE session occurred. The boxes adjacent to the vertical lines specify the variable(s) that each IVE session targeted. In this example, variable B was targeted during the first IVE session, variable 3 was targeted in the second IVE session, and variables A and 2 were targeted in the third IVE session.

Figure 1. Illustration of data from a hypothetical participant in the present study.

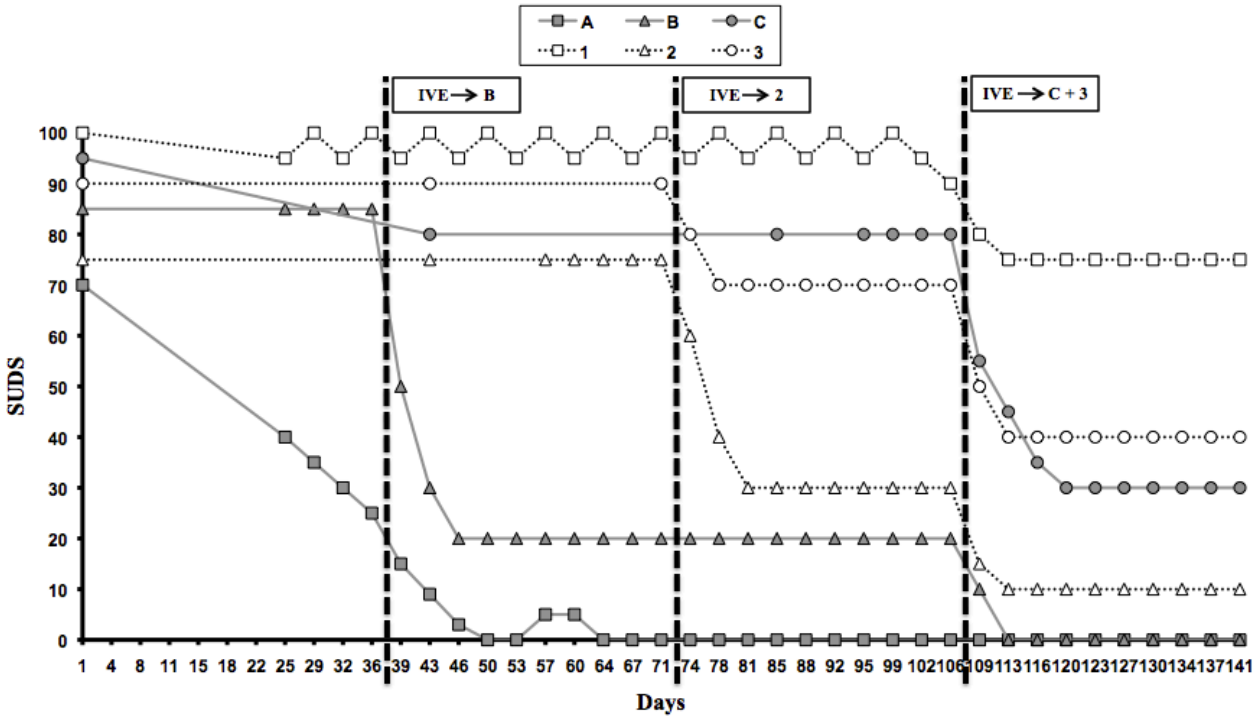

Figure 1 Note. A, B, and C represent three hypothetical foods. 1, 2, and 3 represent three hypothetical eating, weight, and shape situations.
SUDS = Subjective units of distress
IVE = *In vivo* exposure

As illustrated in Figure 1, the patient initially rated all six of these variables at day 1. The three foods (variables A, B, and C) were identified as "forbidden" according to the patient's FPS. The SUDS of the three scenarios (behaviors 1, 2, and 3) at day 1 correspond to the patient's ratings of these three items on the IVESS that we completed during assessment. On day 25, several weeks before the first IVE session, three variables were added to the short fear hierarchies and tracked at each following CBT session: variables A, B, and 1. Variables A and B represent two food items that were identified for the short food hierarchy, and variable 1 represents an eating, weight, and shape scenario included in the short scenario hierarchy. Additionally, three other variables were identified at later points in treatment: variable 2 was

added to the short scenario hierarchy at day 57, variable 3 was added to the short scenario hierarchy at day 71, and variable C was added to the short food hierarchy at day 95. As shown in the figure, data for variables 2, 3, and C were also collected during day 1, and at every six weeks (i.e., at days 43 and 85).

Participants

Participants consisted of five patients between the ages of 14 – 46 who received treatment at the CCBT-ED. Two participants were Caucasian, two were mixed Caucasian and Asian, and one was mixed Caucasian, Asian, and Pacific Islander. All five CCBT-ED patients who were offered participation in the present study consented. Two additional patients provided consent but were excluded from the study as they did not receive IVE sessions. One of these two patients dropped out of treatment before an IVE was scheduled, and the other reported virtually no distress and maximum self-efficacy for all foods and situations measured.

All participants were female and met criteria for OSFED. While most patients who receive services at the CCBT-ED meet full criteria for AN, BN, or BED, there was an atypical absence of these groups of patients during the study period. Moreover, additional information suggests that study participants exhibited less severe eating disorder psychopathology than the patients typically treated at the CCBT-ED: Participant 2 reported scores within one standard deviation of the normal range on the EDE-Q and BSQ-8 during intake, only Participants 4 and 5 had multiple foods with SUDS ratings greater than 50, and Participants 2 and 4 had received treatment at another clinic before transitioning to the CCBT-ED. Additional details about each participant are described in the Results section. Information that could contribute to the identification of any participant was omitted and/or obscured.

Design

A multiple-baseline design across behaviors with five participants was employed. IVE was implemented at various time points throughout treatment to target one or more specific anxiety-provoking stimuli. The SUDS and self-efficacy ratings for the variables targeted by IVE were monitored before and after the implementation of each IVE session (see *Assessment Protocol*). Additionally, variables not targeted by IVE were also monitored throughout treatment. If there is a reduction in SUDS and/or increase in self-efficacy ratings for a certain food following an IVE session targeting that food and no reductions in SUDS and/or increase in self-efficacy ratings for other foods or scenarios to which generalization is not anticipated, it can be inferred that the IVE session caused the change in the self-reported ratings. The conclusion that IVE led to the hypothesized change would be further strengthened by the replication of treatment effects across different variables and participants.

The multiple-baseline design employed for the current investigation is illustrated with the hypothetical data presented in Figure 1. In this example, the first IVE session, occurring between days 36 and 39, targeted variable B, a specific food item. SUDS for the item targeted by the first IVE session (variable B) and the items not explicitly targeted by this IVE session (variables A and 1) have been tracked since day 25. Following the IVE session targeting variable B, there were substantial changes in the SUDS ratings for variable B and minimal to no changes for variables A and 1. Thus, it could be inferred that the first IVE session caused a change in variable B. In this example, the efficacy of IVE in reducing specified SUDS ratings is strengthened by the replication of treatment effects across different variables. For example, following the second IVE session, which targeted variable 2, there were substantial reductions in

SUDS for variable 2, with little to no changes in variables A, B, 1, and 3, increasing confidence that IVE sessions led to reductions in SUDS for specified variables.

IVE sessions were designed to address one or two primary variables. For instance, Participant 3 ate a meal with an unfamiliar person (an IVE therapist she met for the first time) during her first IVE session, which focused on reducing anxiety in one domain: eating a meal with an unfamiliar person. During her second IVE session, she ate a meal with a new IVE therapist who made critical comments about the high fat and calorie content of her meal. This IVE session addressed two variables: eating a meal with an unfamiliar person and receiving critical comments about a meal she was eating.

Prior to all IVE sessions, the one or two primary variables that the exposure aimed to address and the one variable that the exposure was considered *unlikely* to be affected by the exposure were documented on the IVE Form by the investigator. If the specified primary variable(s) exhibited a change in the predicted direction following an IVE session, and there was no change in the variable identified as unrelated, it could be inferred that the IVE session led to the change in the target variable(s).

Consonant with the flexible use of exposure at the CCBT-ED, the investigator, individual therapist, and clinical supervisor decided when each IVE session was implemented according to clinical judgment. The investigator documented the decision-making process used to determine the timing and content of each IVE session at least two weeks before the exposure on the IVE Form.

The data collected from repeated assessment were also used to assist in the determination of the content and timing of IVE sessions. It is unnecessary to use an IVE session to target foods

and situations for which patients report improved ratings throughout the course of CBT, such as variable A in Figure 1. Instead, IVE sessions targeted the specific foods and situations that participants continued to report as challenging, as indicated by SUDS and self-efficacy ratings on the short fear hierarchies. Data collected from repeated assessment informed the number of IVE sessions that were employed to address different domains. This data-driven approach complemented clinical judgment and the individual preferences of the patient to determine the timing, frequency, content, and difficulty of IVE sessions, all of which were documented by the investigator on the IVE Form.

A potential limitation of this flexible approach was the confounding of time with investigator and participant bias, as IVE sessions could have inadvertently been implemented at times when participants would have improved regardless of whether or not they participated in an exposure session. As an example, imagine that a participant in therapy reported increased confidence in her ability to eat anxiety-provoking foods, and that the therapist and patient collaboratively decided to set up an IVE session targeting one of these foods (e.g., lasagna) for the next week. If the patient's SUDS ratings for lasagna was significantly lower following the IVE, it would be unclear whether the participant's change in SUDS was due to the IVE or to the opportune time selected by the therapist and participant to implement the IVE. To address this potential confound, a delay of two weeks occurred between the time that the investigator and therapist (in collaboration with the patient) decided to set up an IVE session and when the IVE session was actually implemented. The investigator documented the date at which each IVE session was planned on the IVE Form.

Another concern with the present study's design was the likelihood for generalization of

treatment effects across non-target variables. With multiple-baseline designs across behaviors, causality is more convincingly demonstrated when there is no change in behaviors until the intervention targeting that behavior is applied (Nock et al., 2008). In other words, if there are changes in variables A, B, and C following an IVE solely targeting variables A, confidence in the causal relationship between IVE and the change in variable A is reduced. Changes in variables B and C following an IVE targeting variable A could be due to generalization effects, or others factors such as stressors in the patient's life, timing, or non-exposure treatment elements. In particular, it seems likely that an IVE targeting a food item (e.g., pizza) may lead to reductions in SUDS ratings for several other food items (e.g., pasta, white bread, grilled cheese sandwich). It is also probable that IVE session targeting a specified eating, weight, or shape scenario (e.g., eating a meal with unknown calorie and nutritional properties) might lead to reductions in self-reported anxiety across a number of other scenarios (e.g., eating a larger meal than someone else), with some exceptions (e.g., receiving critical comments about a meal while eating).

To address the issue of generalization, variables that appeared likely to yield generalization of treatment effects from IVE targeting other variables – heretofore referred to as *related variables* (RVs) – were identified and documented on the IVE Form prior to the implementation of each IVE session. In order to maintain the logic of a multiple-baseline design across behaviors, changes in the *target variable* (TV) were compared to the changes (or lack thereof) in other behaviors. However, the primary focus for comparison were behaviors *not* identified as being likely to experience generalization effects, or *unrelated variables* (UVs). In other words, after introducing an IVE targeting a TV, causality can be inferred if there is a

change in the TV and no change in the UV. While there were no specific hypotheses about the SUDS ratings of RVs, these variables were examined before and after each IVE session and described in a post-hoc, exploratory fashion.

Data Analysis

Visual inspection. Interpretation of single-case experimental designs has traditionally relied on visual inspection of data (Hayes et al., 1999), rather than the inferential statistics used with group comparison designs. While visual inspection of data has been criticized for permitting multiple interpretations of data, causal effects need to be strong enough and clinically significant in order to be detected via visual inspection (Nock et al., 2008). As a result, visual inspection of data is less likely to result in a Type I error and tends to be a more conservative approach than inferential statistics for inferring causality. Indeed, a limitation of visual inspection is that small but potentially meaningful effects can go unnoticed (Nock et al., 2008).

The study's hypotheses were evaluated by graphing the data (see Figure 1 as an example) and inspecting patterns of change following the implementation of IVE sessions. Kazdin (1982) delineated several principles to facilitate visual inspection of single-case experimental designs, three of which were employed in the present study: change in mean, change in level, and change in trend. In the current investigation, a *change in mean* was demonstrated if there was a greater reduction in SUDS or increase in self-efficacy ratings for the specified TV than the UV following the IVE session. Similarly, a *change in level* involved the inspection of ratings before and after an IVE session, but the focus was on the one session immediately before and after the IVE. To investigate a *change in trend*, the slope of the data before and after each IVE session was examined.

Statistical analyses. Despite the advantages of visual inspection when interpreting results from single-case experimental designs, a growing number of researchers recommend the use of statistical analysis to supplement visual inspection (Parker & Brossart, 2003). According to a panel of national experts on single-case designs, regression-based estimators appear to provide the best option for both technical and practical reasons: regression methods can model trends in data, require only a single case to determine an effect size, are familiar to researchers, and provide results that tend to be more easily understood (Kratochwill et al., 2010).

When compared to four other relatively common statistical analyses for single-case research, the regression technique known as Allison's mean plus trend difference (ALLISON-MT; Allison & Gorman, 1993; Faith et al., 1996) was found to have the best agreement with professional judgments of intervention effectiveness via visual inspection and strong statistical power to identify significant results (Brossart, Parker, Olson, & Mahadevan, 2006). In view of these advantages, ALLISON-MT was used as the primary statistical approach in the present study. The ALLISON-MT method involved creating two predictor variables: a dummy coded variable that represented treatment (e.g., 0 = baseline or pre-intervention phase, 1 = treatment or post-intervention phase) and a variable that represented time (e.g., number of days). If the slope during the pre-intervention (i.e., baseline) phase was zero or in the *opposite* direction of the predicted trend following the implementation of the intervention, then a multiple regression was conducted with treatment and time as predictors and the time-series data (i.e., dependent variable) as the outcome.

On the other hand, if the slope during the pre-intervention phase was in the *same* direction as the predicted trend following the intervention, then a simple linear regression was

first conducted with time as a predictor variable and the time-series data from the pre-intervention phase only as the outcome variable. The residual scores from this regression were calculated, and the predicted values of the outcome variable were carried over through the post-intervention phase. These predicted values were subtracted from the actual post-intervention scores to obtain the post-intervention residuals. The final multiple regression equation included the "detrended" time-series data (the residuals from the pre-intervention and post-intervention phases) as the outcome variable, and treatment and the time × treatment interaction as the predictor variables (Ross & Begeny, 2014). Faith et al. (1996) recommend using adjusted R^2 rather than R^2 as a measure of the effect size to account for the number of predictors.

ALLISON-MT was used in the present study to calculate the adjusted R^2 value for the TV(s) targeted by each IVE session. The adjusted R^2 values for the UV and RVs of interest in response to each IVE were also computed and compared to the adjusted R^2 value obtained for the TV(s). The "baseline" or "pre-intervention" phase was examined as a "short phase" and "long phase." The pre-intervention short phase consisted of the three data points collected before the IVE session of interest, while the pre-intervention long phase included all data points since the prior IVE session up through the last data point before the IVE session of interest (for the first IVE session, this phase included all data points collected prior to the IVE). Similarly, the "treatment" or "post-intervention" phase consisted of a short and long phase. The post-intervention short phase included the three data points after the IVE session of interest. The post-intervention long phase was comprised of all the data points after the IVE session up through the last data point before the next IVE session (for the last IVE session, this phase included all data points obtained until the end of data collection).

Despite the advantages of ALLISON-MT as a statistical approach for single-case experimental designs, it should be noted that ALLISON-MT has been found to be more sensitive to the effects of autocorrelation (i.e., the nonindependence of sequential observations) than some other approaches. Due to limitations inherent in all statistical approaches evaluating single-case designs, experts have recommended conducting "sensitivity analyses" (Kratochwill et al., 2010). One way that this might be done is by calculating effect sizes from more than one statistical method and subsequently comparing the estimated effect sizes from these multiple methods. An effect size that is particularly familiar to social scientists and relatively straightforward to compute for single-case experimental designs is Cohen's *d* (Smith, 2012), which involves calculating the difference between data before and after a phase change and dividing this difference by some version of within-phase variance (Kratochwill et al., 2010). Busk and Serlin (1992) define a within-subject effect size as the ratio of the control and treatment mean difference to the baseline standard deviation. If the baseline standard deviation is zero, then a pooled standard deviation from the baseline phase and treatment phase is used as the denominator. This statistical approach does not assume that there is a normal distribution or equal variances and intercorrelations across pre-treatment and post-treatment phases. Although calculating a within-subject effect size in this way has been criticized for not adequately addressing the issue of autocorrelation, it provides an accessible approach that might supplement other visual and statistical analyses (Smith, 2012). The Cohen's *d* values obtained using this method can only be compared to the *d* values from single-subject designs using a comparable approach. In other words, the *d* values can be compared within each subject and between the subjects in the present study, but not to effect sizes from other single-case designs using this

statistical approach (e.g., Nakamura et al., 2014) or to the standard effect size benchmarks for between-group studies (Cohen, 1992).

In sum, four different effect sizes were obtained for all TVs and UVs assessed at CBT sessions before and after each IVE session. The first effect size, adjusted R^2, was calculated using ALLISON-MT during both short and long phases. The second effect size, Cohen's *d*, was computed using the within-subject effect size procedures developed by Busk and Serlin (1992), and also examined using criteria for both short and long phases. These statistically derived effect sizes complimented visual inspection of data, which focused on changes in mean, level, and trend.

Interrater agreement. The principal investigator listened to a random selection of audio sessions from each participant in the present study and completed a CCBT-ED therapist checklist for each of these sessions. These checklists were compared to those completed by the primary therapist to determine interrater agreement. Cohen's kappa coefficient (κ) was used to measure interrater agreement, which accounts for agreement that might occur by chance (Cohen, 1960). To determine the interrater agreement between the principal investigator and primary therapist on each CCBT-ED therapist checklist, the number of items that both the principal investigator and primary therapist endorsed as occurring during the session were counted. Additionally, the number of items that these two raters both left blank were tallied. These two totals were summed and then divided by the total number of items on the measure to determine the relative observed agreement among raters (p_o). To determine the probability of random agreement between raters (p_e), the percentage of items endorsed by the principal investigator and primary therapist were calculated and multiplied. Similarly, the percentage of items left blank by the principal

investigator and primary therapist were calculated and multiplied. These two products were summed to generate the probability of random agreement. Cohen's kappa coefficient was calculated using the formula: $(p_o - p_e)/(1 - p_e)$. According to Landis and Koch (1977), a kappa coefficient less than 0.0 indicates poor agreement, between 0.0 and 0.2 indicates slight agreement, between 0.21 and 0.40 indicates fair agreement, between 0.41 and 0.60 indicates moderate agreement, between 0.61 and 0.80 indicates substantial agreement, and between 0.81 and 1.0 indicates almost perfect agreement.

Results

Participant 1

Demographics and clinical characteristics. Participant 1 was an adolescent referred to the CCBT-ED clinic by her mother, who had concerns about the participant's significant food avoidance, calorie restriction, and instances of self-induced vomiting. Participant 1 received a diagnosis of OSFED, atypical AN from the CCBT-ED. Her BMI during intake was 18.3; at her current height, her highest BMI was 19.2 and her lowest was 18.0. In view of her weight history, Participant 1's BMI at the time of assessment did not meet criteria for "significantly low body weight," precluding a diagnosis of AN.

Participant 1 exhibited significant calorie restriction to maintain a low body weight, and reported engaging in an average of one binge-eating and one purging episode per week, with infrequent laxative abuse. Participant 1 stated that she began dieting at age 14 years, which progressively evolved into more extreme calorie restriction. The participant's calorie restriction and drive for thinness were further reinforced by her involvement in an activity that required her to maintain a low body weight. Participant 1 also reported experiencing symptoms of depression and anxiety since middle school. She indicated taking antidepressant medication for the last several years, which she discontinued within the first month of treatment.

Participant 1 initially reported a global EDE-Q score of 4.73, which is greater than two standard deviations above the mean of a normative sample of young adult women (Mond, Hay, Rodgers, & Owen, 2006) and between the 60th and 70th percentiles for treatment-seeking females with eating disorders (Aardoom, Dingemans, Slof Op't Landt, & Van Furth, 2012). Participant 1's initial BSQ-8 score of 45 was greater than two standard deviations above the mean of a

normative sample of young adult Swedish women (Welch, Lagerstrom, & Ghaderi, 2012). Participant 1 did not complete the FOFM at intake. She rated almost all of the scenarios on the IVESS with a SUDS of 50 or greater.

CBT interventions and treatment outcomes. Participant 1 received a total of 30 CBT sessions and one IVE over a period of 215 days, before moving to a different country and terminating treatment. As noted in Table 1, 71% of Participant 1's CBT sessions included interventions aimed at enhancing motivation to recover and maintaining engagement in treatment. The participant indicated that she was primarily interested in eliminating her binge eating and purging and reducing her preoccupation with food, but did not want to gain weight, particularly because weight gain would jeopardize her participation in an activity that required her to maintain a low body weight. Consequently, treatment focused heavily on exploring the incompatible relationship between the participant's involvement in this activity and her eating disorder symptoms.

In addition to interventions aimed at enhancing motivation, the majority of CBT sessions also included self-monitoring and meal planning, in-session weighing, and psychoeducation (see Table 1). Consistent with CBT protocols for eating disorders (e.g., Garner et al., 1997; Fairburn, 2008; Waller et al., 2007), Participant 1 completed daily food records documenting her eating behaviors, collaboratively planned the foods she would eat between treatment sessions, and was weighed in session once per week. Most of the psychoeducation included in Participant 1's CBT sessions involved providing her with accurate information about nutrition, regular eating, and strict dieting.

Table 1. The percentage of each participant's CBT sessions that included at least one intervention from eight broader categories.

Intervention Category	Percentage of CBT Sessions Using Intervention from Category				
	P1	P2	P3	P4	P5
Psychoeducation	57%	13%	22%	55%	91%
Enhancing Motivation	71%	2%	47%	18%	74%
In-Session Weighing	71%	76%	56%	64%	76%
Self-Monitoring and Meal Planning	79%	16%	75%	95%	88%
Cognitive Interventions for ED Concerns	43%	60%	56%	41%	81%
Behavioral Interventions for ED Concerns	18%	49%	44%	50%	45%
CBT for non-ED Concerns	14%	87%	31%	95%	81%
Relapse Prevention	18%	4%	16%	18%	9%

Table 1 Note. P1 = Participant 1; P2 = Participant 2; P3 = Participant 3; P4 = Participant 4; P5 = Participant 5

All of Participant 1's self-report measures indicated that she improved substantially over the course of treatment. According to her food records and information discussed with her therapist, Participant 1 progressively increased her calorie intake, reduced her avoidance of feared foods, ate a normal range and amount of food, and eliminated binge eating and purging. Participant 1's mother also shared her perspective that the patient improved across these domains. By the end of treatment, Participant 1's EDE-Q global score of 0.68 was within one standard deviation of the mean of a community sample of young adult women and below the 5th percentile for women with eating disorders. Similarly, her final BSQ-8 score of 15 was within one standard deviation of the mean of a normative sample of young adult women. Participant 1's scores on all three subscales of the FOFM also indicated low levels of food anxiety: she received a final score of 9 on the Anxiety about Eating subscale (which is within one standard deviation of the mean of a small sample of health controls; Levinson & Byrne, 2014), 8 on the

Food Avoidance Behaviors subscale (below one standard deviation of the mean of healthy controls), and 16 on the Feared Concerns subscale (within one standard deviation of the mean of health controls).

Despite these encouraging indicators of improvement, Participant 1's weight remained stable throughout treatment. Given that the patient denied ever experiencing a period of frequent binge eating or overeating in her past, her lifetime high BMI of 19.2 was likely a more accurate approximation of her weight when eating in an unrestrained manner than the BMI of approximately 18.3 that she maintained over the course of treatment. The possible inconsistency between her slightly suppressed weight and self-report of unrestricted eating suggest that she remained interested in keeping her weight at a level consistent with participation in the activity she valued.

IVE and related outcomes. Due in part to Participant 1's report that she was successfully incorporating previously avoided foods into her diet and her relatively low SUDS ratings on the IVESS, IVE sessions targeting food or eating were not considered clinically indicated. After five months of treatment, the patient reported that she did not find any of the eating, weight, and shape situations listed on the IVESS particularly anxiety-provoking, assigning most a SUDS rating of 10 or lower, and none a rating over 50. At this point, however, she did express some anxiety and avoidance related to eating and being physically active while wearing a bathing suit, and an IVE targeting these domains was developed collaboratively by the participant and her therapist.

As planned, Participant 1 and an IVE therapist met at a beach. Wearing a bathing suit, Participant 1 ate a sandwich with tortilla chips while talking to the IVE therapist, who wore a t-

shirt and shorts. The participant and IVE therapist then engaged in some light physical activity together, including kicking a soccer ball back and forth and jogging. Participant 1 reported a SUDS rating of 20 when she started eating in her bathing suit, which reduced to a SUDS of 10 and then increased again to a SUDS of 20. Her SUDS rating increased to 40 during the soccer ball activity, then reduced to a SUDS rating of 10 within several minutes. After starting to jog, the patient reported SUDS ratings of 60, 80, and 70, reducing to a rating of 30 several minutes after jogging stopped and to 10 an hour later.

Figure 2. Participant 1's SUDS ratings of three situations over the course of treatment: (1) eating a meal in a bathing suit, (2) being active in a bathing suit, and (3) eating a meal when not hungry.

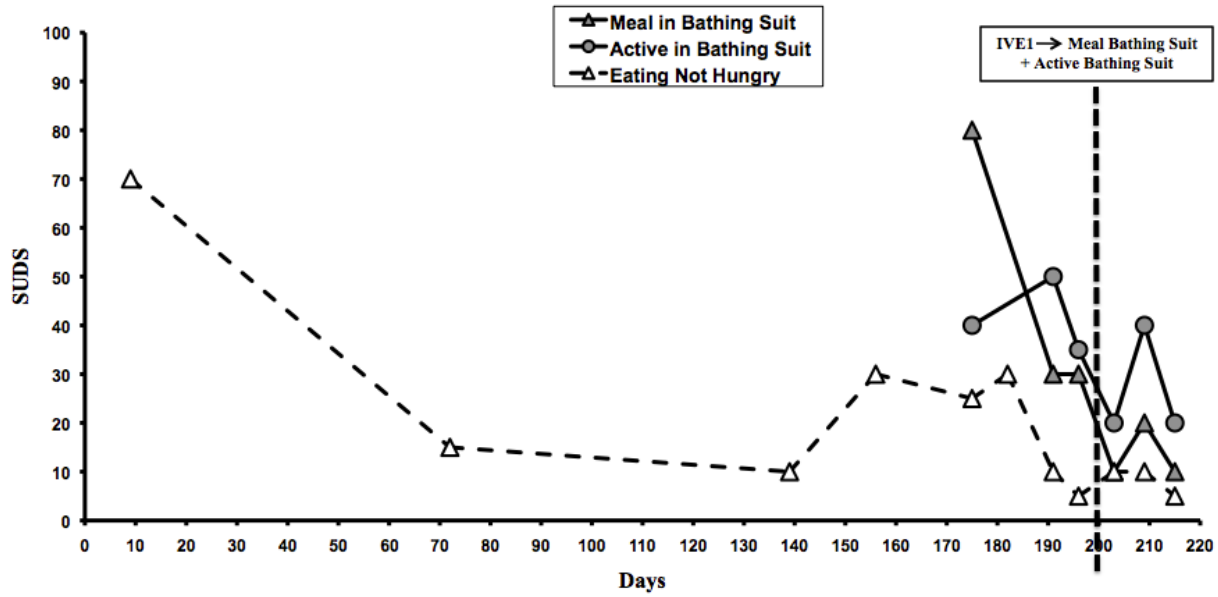

Figure 2 Note. Higher ratings indicate more distress. Ratings were obtained at the start of each CBT session. The vertical dashed line represents when the patient participated in an IVE session, which targeted anxiety related to eating a meal in a bathing suit and being active in a bathing suit.
SUDS = Subjective units of distress
IVE = *In vivo* exposure

Visual inspection of SUDS. Figure 2 illustrates Participant 1's SUDS ratings of the two TVs (eating a meal in a bathing suit and being active in a bathing suit) and one UV (eating when

not hungry) collected during CBT sessions before and after the IVE. Visual inspection of the several data points before and after the IVE indicated that both TVs exhibited a decrease in mean following the IVE; however, the mean UV rating also decreased, precluding conclusions that the IVE was responsible for reductions in the TVs. Visual inspection of level (i.e., the one data point before and after the IVE) supported the study's hypothesis: both TVs exhibited a decrease in SUDS after the IVE, while the UV increased slightly. On the other hand, Participant 1 provided a very low SUDS rating of 5 for the UV in the session before the IVE, such that a floor effect likely curtailed further decreases. Visual inspection of trend did not support the study's hypotheses, as the TVs exhibited a sharper negative slope prior to the IVE than they did afterwards. Floor effects may have prevented any decreases in trend in the TVs. Due to floor effects and decreasing trends across all variables before the IVE, no conclusions can be made about the efficacy of this IVE for Participant 1.

Statistical analyses of SUDS. Table 2 presents adjusted R^2 values from ALLISON-MT and within-subject Cohen's *d* effect sizes of the change in SUDS before and after IVE within both "short" and "long" phases. Effect sizes for the long phases were not calculated for Participant 1, as her SUDS ratings of TVs were obtained at only three time points before and after the IVE. Consistent with the study's hypotheses, ALLISON-MT yielded a positive (albeit small) effect for the TV of being physically active in a bathing suit, and a negative effect for the UV of eating a meal when not hungry. Inconsistent with the study's hypotheses, a negative effect was obtained for the TV of eating a meal in a bathing suit. While positive within-subject Cohen's *d* effect sizes were calculated for the two TVs, a positive *d* was also obtained for the UV.

Table 2. Results from statistical analyses investigating changes in subjective units of distress after exposure sessions.

Participant	Target Variable(s)		Unrelated Variable
1	Meal in Bathing Suit	Active in Bathing Suit	Eating Not Hungry
IVE 1			
Short Phases			
Adjusted R^2	-0.51	0.05	-0.75
Cohen's *d*	1.15	1.96	0.77
Long Phases			
Adjusted R^2	--	--	--
Cohen's *d*	--	--	--
2	Critical Comments		Gym Around Others
IVE 1			
Short Phases			
Adjusted R^2	0.04		0.03
Cohen's *d*	4.33		2.84
Long Phases			
Adjusted R^2	0.00		0.00
Cohen's *d*	0.86		1.24
IVE 2			
Short Phases			
Adjusted R^2	0.73		0.82
Cohen's *d*	0.92		1.31
Long Phases			
Adjusted R^2	0.97		0.41
Cohen's *d*	1.34		1.68
3	Unfamiliar Person	Critical Comments	Eating Not Hungry
IVE 1			
Short Phases			
Adjusted R^2	0.00		0.00
Cohen's *d*	-1.15		0.33
Long Phases			
Adjusted R^2	-0.57		0.00
Cohen's *d*	0.30		3.57

Table 2 (cont.). Results from statistical analyses investigating changes in subjective units of distress after exposure sessions.

	Unfamiliar Person	Critical Comments	Eating Not Hungry
IVE 2			
Short Phases			
Adjusted R^2	0.00	0.00	0.00
Cohen's *d*	1.29	0.58	-0.87
Long Phases			
Adjusted R^2	0.14	-0.39	0.34
Cohen's *d*	1.75	3.00	0.08

4	Noisy Eating	Critical Comments
IVE 1		
Short Phases		
Adjusted R^2	0.00	0.00
Cohen's *d*	1.15	1.20
Long Phases		
Adjusted R^2	0.00	0.51
Cohen's *d*	0.91	2.04

5	Vegan Pizza	Eating More than Other Person	Tight Clothing
IVE 1			
Short Phases			
Adjusted R^2	0.78	0.74	--
Cohen's *d*	8.66	4.04	--
Long Phases			
Adjusted R^2	0.70	0.01	0.04
Cohen's *d*	8.66	0.43	-0.46

Table 2 Note. Larger positive values suggest greater decreases in distress ratings following an exposure session. Negative values suggest increases in distress ratings following an exposure session. The study's primary hypothesis is supported when the value of a target variable is greater than the value of an unrelated variable.
IVE = *In vivo* exposure

Visual inspection of self-efficacy ratings. Figure 3 presents Participant 1's self-efficacy ratings assessed at CBT sessions before and after her IVE. According to visual inspection of mean and level, both TVs increased as hypothesized; however, the UV also demonstrated an increase in mean and level following the IVE. The TVs and UV exhibited sharper increases in the trend of self-efficacy ratings prior to the IVE relative to afterwards, likely because of a ceiling effect. Similar patterns across variables preclude conclusions about whether IVE contributed to any of these changes.

Figure 3. Participant 1176's self-efficacy ratings of three situations over the course of treatment: (1) eating a meal in a bathing suit, (2) being active in a bathing suit, and (3) eating a meal when not hungry.

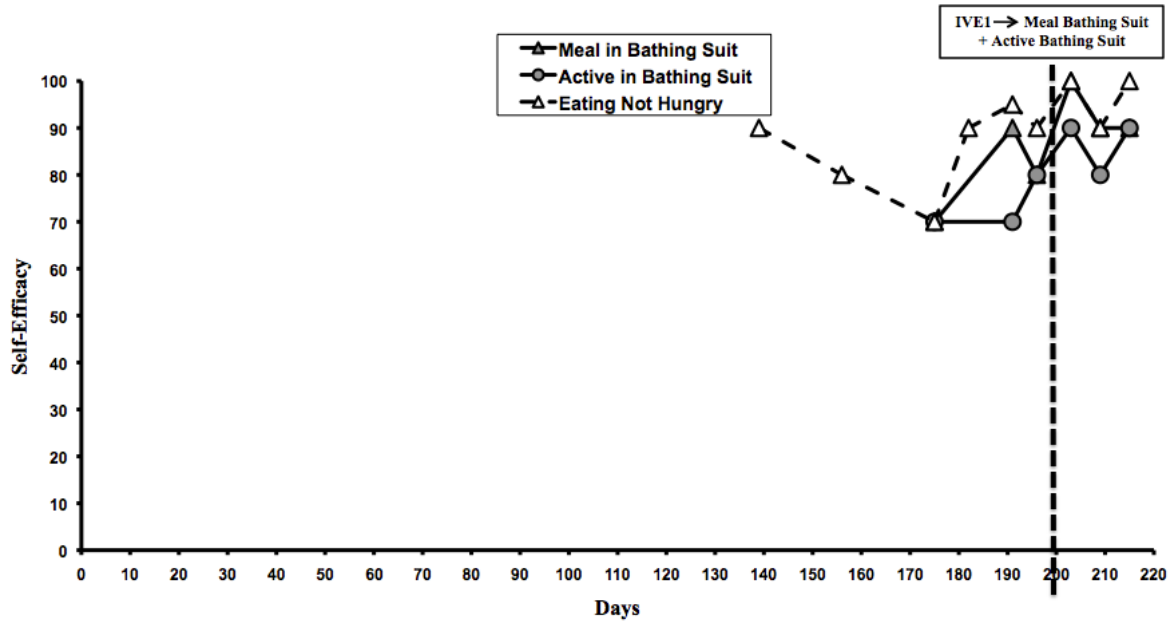

Figure 3 Note. Higher ratings indicate greater self-efficacy. Ratings were obtained at the start of each CBT session. The vertical dashed line represents when the patient participated in an IVE session, which targeted self-efficacy related to eating a meal in a bathing suit and being active in a bathing suit.
IVE = *In vivo* exposure

Table 3. Results from statistical analyses investigating changes in self-efficacy ratings after exposure sessions.

Participant	Target Variable(s)		Unrelated Variable
1	Meal in Bathing Suit	Active in Bathing Suit	Eating Not Hungry
IVE 1			
Short Phases			
Adjusted R^2	0.00	0.00	-0.28
Cohen's *d*	1.33	2.31	0.94
Long Phases			
Adjusted R^2	--	--	--
Cohen's *d*	--	--	--
2	Critical Comments		Gym Around Others
IVE 1			
Short Phases			
Adjusted R^2	-0.07		0.00
Cohen's *d*	-0.87		0.58
Long Phases			
Adjusted R^2	-0.51		-0.82
Cohen's *d*	0.77		0.72
IVE 2			
Short Phases			
Adjusted R^2	-0.45		0.17
Cohen's *d*	0.87		1.00
Long Phases			
Adjusted R^2	0.96		0.86
Cohen's *d*	1.64		1.38
3	Unfamiliar Person	Critical Comments	Eating Not Hungry
IVE 1			
Short Phases			
Adjusted R^2	-0.90		0.00
Cohen's *d*	0.98		0.72
Long Phases			
Adjusted R^2	0.00		0.09
Cohen's *d*	0.86		0.60
IVE 2			
Short Phases			
Adjusted R^2	0.00	0.00	-0.41
Cohen's *d*	-1.15	1.73	-1.15

Table 3 (cont.). Results from statistical analyses investigating changes in self-efficacy ratings after exposure sessions.

	Unfamiliar Person	Critical Comments	Eating Not Hungry
Long Phases			
Adjusted R^2	-0.13	0.00	-0.73
Cohen's *d*	-0.47	1.47	-0.52

4	Noisy Eating	Critical Comments
IVE 1		
Short Phases		
Adjusted R^2	-0.83	-0.34
Cohen's *d*	-0.29	0.10
Long Phases		
Adjusted R^2	-0.98	-0.83
Cohen's *d*	-0.42	0.25

5	Vegan Pizza	Eating More than Other Person	Tight Clothing
IVE 1			
Short Phases			
Adjusted R^2	0.00	-0.84	--
Cohen's *d*	1.44	0.83	--
Long Phases			
Adjusted R^2	0.92	-0.23	0.00
Cohen's *d*	-1.59	1.15	-0.31

Table 3 Note. Larger positive values suggest greater increases in self-efficacy ratings following an exposure session. Negative values suggest decreases in self-efficacy ratings following an exposure session. The study's primary hypothesis is supported when the value of a target variable is greater than the value of an unrelated variable. IVE = *In vivo* exposure

Statistical analyses of self-efficacy ratings. Adjusted R^2 values from ALLISON-MT and within-subject Cohen's *d* effect seizes for Participant 1 are noted in Table 3. Inconsistent with the present study's hypotheses, adjusted R^2 values of 0 were calculated for both TVs. Although positive within-subject Cohen's *d* effect sizes were obtained for the two TVs, a positive *d* was also calculated for the UV.

Satisfaction with IVE. Although Participant 1 reported to her therapist that the IVE session was valuable, the participant did not complete an IVE Feedback Form, despite multiple attempts to obtain this information from her.

Participant 2

Demographics and clinical characteristics. Participant 2 was a young adult who received a diagnosis of OSFED, BED of low frequency from the CCBT-ED. Her BMI at assessment was 26.0, with a reported high BMI of 29.2 and low BMI of 20.9 at her present height. Participant 2 indicated that she began significantly restricting her calorie intake in an effort to lose weight approximately two years prior to her assessment, which soon led to the onset of binge eating at an average frequency of two times per week. Approximately two months before being assessed at the CCBT-ED, the participant entered inpatient treatment for OCD and binge-eating disorder. She noted that treatment included exposure therapy to address both OCD and binge eating.

Participant 2 sought outpatient services from the CCBT-ED with the goals of maintaining her gains from inpatient treatment and reducing her anxiety about a range of social situations related to eating. At intake with the CCBT-ED, the participant stated that she was experiencing distressing episodes of overeating less than once per week. She denied objective binge episodes,

loss of control while eating, purging, or laxative abuse. The participant reported a history of intermittent symptoms of OCD and depression since adolescence, and received prior individual psychotherapy for more than seven years to address these difficulties. Participant 2 had been taking antidepressant medication for over three years, which she continued to take as a participant in the present study.

At assessment, Participant 2 reported a global EDE-Q score of 1.80, which is within one standard deviation of the mean based on a sample of healthy women and between the 5th and 10th percentiles of treatment-seeking females with eating disorders. Her initial BSQ-8 score of 24 was also within one standard deviation of the mean of a community sample of women. Relative to a small sample of healthy controls, Participant 2's score of 15 on the Anxiety about Eating subscale and 20 on the Feared Concerns subscale of the FOFM were both greater than one standard deviation above the mean. Her score of 7 on the Food Avoidance Behaviors subscale of the FOFM was less than one standard deviation below the mean. Despite relatively low scores across the EDE-Q, BSQ-8, and FOFM, the participant reported a SUDS rating of 50 or greater on all but three items on the IVESS at intake, suggesting that she continued to exhibit moderate to high levels of anxiety about a range of situations related to eating, weight, and shape.

CBT interventions and treatment outcomes. Participant 2 continues to receive treatment from the CCBT-ED. The present study includes data from 52 CBT and two IVE sessions over 434 days. As noted in Table 1, 87% of Participant 2's CBT sessions included cognitive and behavioral interventions for concerns that were not directly related to eating behaviors. A substantial number of the participant's CBT sessions focused on supporting her with building autonomy from her family, effectively handling ongoing conflict with her

significant other, and developing appropriate distress tolerance and emotion regulation skills. As Participant 2 did not exhibit symptoms of significant calorie restriction, binge eating, or purging, only 16% of CBT sessions included self-monitoring and meal planning, all of which occurred during her first two months in treatment. More than half of the participant's CBT sessions involved cognitive approaches to address eating disorder concerns, including identifying and challenging anxious thoughts about eating-related social situations.

Participant 2's relatively low scores on the EDE-Q, BSQ-8, and FOFM subscales reduced further over the course of treatment. Scores from the last administration of these measures were all below the means obtained in samples of healthy controls. Participant 2 lost 5 lbs. within the first three months of treatment, perhaps due to her continued abstinence from binge eating. She maintained a BMI of approximately 25 and denied having any binge-eating or purging episodes throughout the course of treatment at the CCBT-ED.

IVE and related outcomes. From the start of treatment at the CCBT-ED, Participant 2 expressed significant concern about other people's judgment of her food choices and exhibited difficulties being assertive with others in eating-related situations. She often avoided eating certain foods in public due to fears of negative evaluation, modified her food choices to match what she thought others perceived as acceptable, and endorsed other people's stated beliefs about dieting and thinness despite having divergent views herself. During her third month of treatment at the CCBT-ED, the participant and her primary therapists began planning an IVE to address these concerns. She expressed anxiety but also a high level of interest in planning and participating in challenging IVE sessions to practice assertiveness skills, reduce her apprehension and avoidance of eating around others, reinforce her pro-recovery values, and increase her ability

to tolerate eating in a wide range of potentially difficult social situations.

For her first IVE session, Participant 2 met an IVE therapist at a casual restaurant. The IVE therapist reviewed the plan that the participant had previously worked out with her primary therapists, which involved purchasing and eating a cheeseburger and fries with an IVE therapist who ate a veggie burger. During three blocks of time lasting approximately ten minutes each, the IVE therapist role-played different characters representing people in the participant's life, including a parent concerned about whether the participant is making the healthiest food choices and a friend bragging about her own recent weight loss and willpower to adhere to a strict diet. The challenge of these critical comments generally increased over the course of the IVE. Participant 2 reported a SUDS of 50 at the start of the IVE session, with subsequent levels fluctuating between a low rating of 35 and high rating of 60. She endorsed a SUDS rating of 20 ten minutes after the end of the exposure, which reduced to a 10 over the next hour.

During CBT sessions following the IVE, Participant 2 indicated that the exposure was helpful, but that the IVE therapist's frequent transitions in and out of character contributed some artificiality to the session. The participant expressed an interest in planning a more challenging IVE with a new IVE therapist who stays in character throughout the entire session. A second IVE was scheduled two months later. During this session, the participant met a new IVE therapist at a food court in a mall. The participant chose to eat a calorie-rich pasta while the IVE therapist ate a lighter pasta. Consistent with the participant's goal to make this second IVE session particularly challenging, the IVE therapist frequently made exceptionally critical and rude comments about the participant's meal (e.g., "*That's* what you decided to eat?!", "Aren't you worried that you'll become fat and lose your boyfriend?"). Despite the therapist's attempts

to make this IVE session as challenging as she could, the participant's SUDS never exceeded the rating of 50 she reported at the start of the exposure. Her ratings fluctuated between 30 and 50 throughout, with a rating of 30 at the end of the IVE and ten minutes after the session had ended.

Visual inspection of SUDS. Figure 4 displays Participant 2's SUDS ratings of the identified TV (receiving critical comments about a meal she is eating) and UV (working out at the gym around other people) throughout treatment. Visual inspection of mean was consistent with the study's hypothesis, as SUDS exhibited a decrease in the several CBT sessions following the first and second IVE sessions. Notably, Participant 2's SUDS rating of the TV after the first IVE reduced from 85 to 60, her lowest rating for this item since starting treatment. The SUDS decreased further to a rating of 40 in the subsequent CBT session. On the other hand, the participant's SUDS ratings of the UV exhibited similar reductions following the first IVE session, and even greater reductions following the second IVE, precluding the conclusion that the exposure sessions contributed to reduction in SUDS ratings.

Similarly, visual inspection of level indicated a reduction in the one SUDS rating directly before and after the first IVE session for both the TV and UV. The participant reported the same SUDS rating of the TV before and after the second IVE, while the SUDS rating of the UV decreased. Visual inspection of trend indicated an increase in both the TV and UV following the first IVE, and a decrease in trend in the TV and UV after the second IVE.

Statistical analyses of SUDS. When examining changes in SUDS of the TV in the short phases, ALLISON-MT produced adjusted R^2 values of similar magnitudes for the TV and UV following both IVE sessions, as noted in Table 2. ALLISON-MT revealed an adjusted R^2 of zero for SUDS of both the TV and UV during the long phases for the first IVE, indicating that this

Figure 4. Participant 2's SUDS ratings of two situations over the course of treatment: (1) receiving critical comments about a meal that she is eating and (2) working out at the gym around other people.

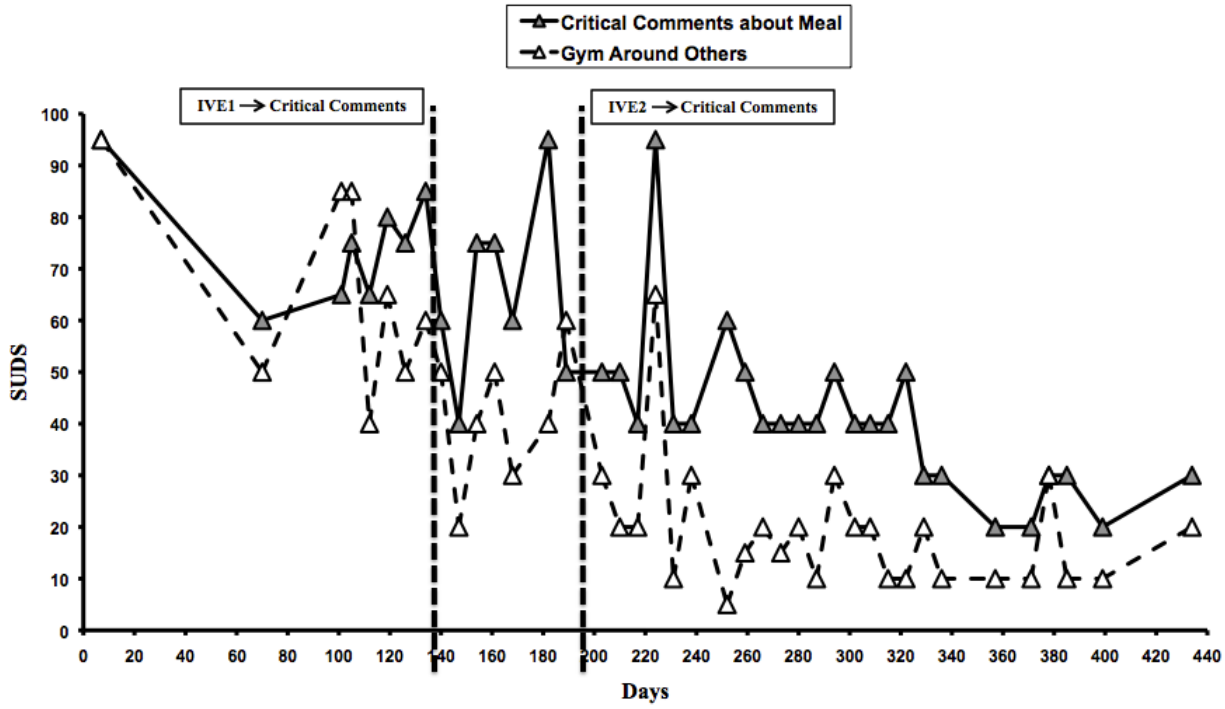

Figure 4 Note. Higher ratings indicate more distress. Ratings were obtained at the start of each CBT session. The vertical dashed lines represent when the patient participated in her first and second IVE session, both of which targeted anxiety related to receiving critical comments about a meal that she was eating.
SUDS = Subjective units of distress
IVE = *In vivo* exposure

IVE session did not impact the change in SUDS over time. For the second IVE in the long phases, positive adjusted R^2 values were obtained for both the TV and UV.

In both the short and long phases, within-subject Cohen's *d*s of similar magnitudes were found for the TV and UV following the first and second IVE sessions.

Visual inspection of self-efficacy ratings. Figure 5 presents Participant 2's self-efficacy ratings assessed at CBT sessions before and after her first and second IVE. According to visual inspection of mean, self-efficacy ratings of both the TV and UV were higher in the several

Figure 5. Participant 2's self-efficacy ratings of two situations over the course of treatment: (1) receiving critical comments about a meal that she is eating and (2) working out at the gym around other people.

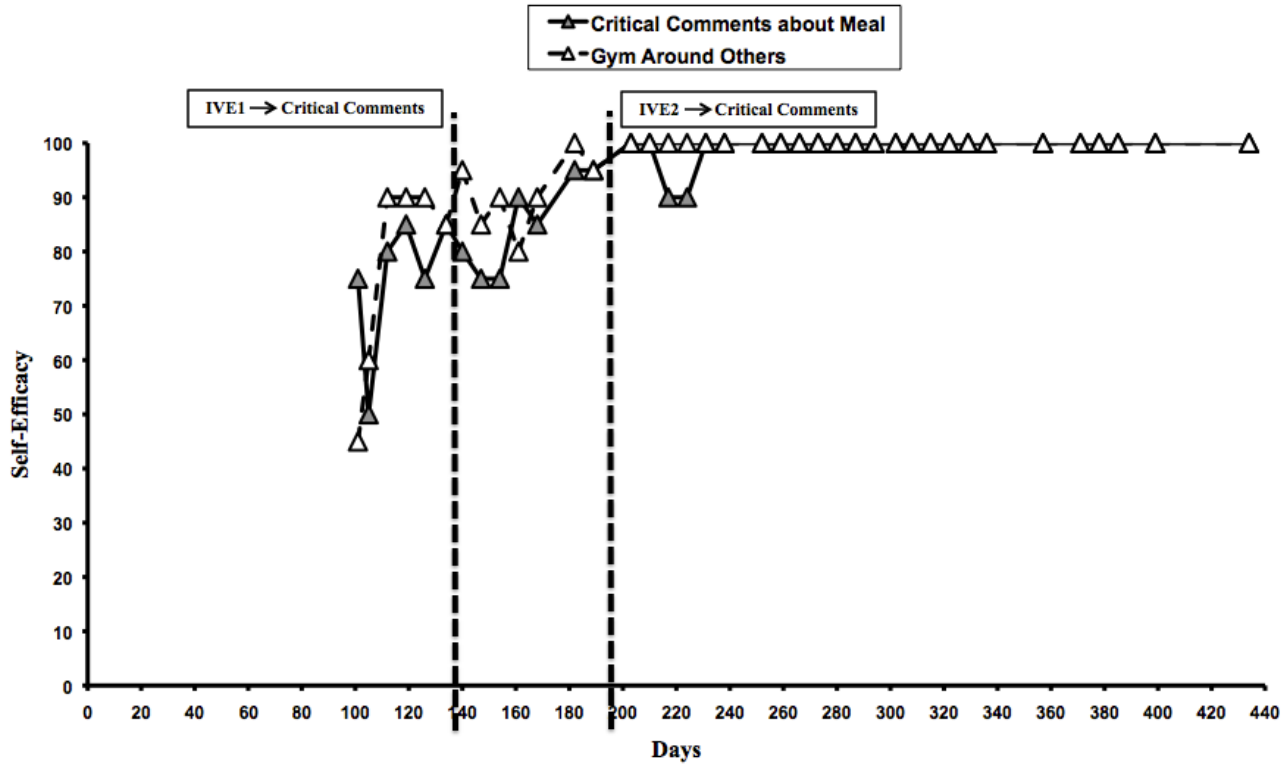

Figure 5 Note. Higher ratings indicate greater self-efficacy. Ratings were obtained at the start of each CBT session. The vertical dashed lines represent when the patient participated in her first and second IVE session, both of which targeted self-efficacy related to receiving critical comments about a meal that she was eating.
IVE = *In vivo* exposure

sessions after the first and second IVEs relative to the ratings before these two exposure sessions. Inconsistent with the study's hypotheses, there was a decrease in self-efficacy level of the TV and increase in level of the UV after the first IVE. Following the second IVE, there was an increase in level for both the TV and UV.

Participant 2's self-efficacy ratings exhibited greater increases toward the beginning of treatment. Although her ratings continued to increase over the course of treatment, the

magnitude of this increase reduced over time, likely due to ceiling effects. After the second IVE, Participant 2 reported a maximum self-efficacy rating of 100 for both TV and UV, and maintained this rating for almost all of her subsequent CBT sessions. As a result, visual inspection of trend indicated decreases in trend of self-efficacy ratings following both IVEs.

Statistical analyses of self-efficacy ratings. In the short phases, negative adjusted R^2 values were calculated for changes in self-efficacy ratings of the TV following the first and second IVEs, suggesting that the trend in self-efficacy became less positive following exposure sessions (see Table 3). During the long phases, negative adjusted R^2 values were found for both the TV and UV following the first IVE, while both variables received positive values after the second IVE.

In the short phases before and after the first IVE, a negative within-subject Cohen's *d* was calculated for the TV. For the second IVE, positive values of similar magnitude were obtained for the TV and UV. All *d*s calculated during the long phases were positive, with similar values yielded for the TV and UV.

Satisfaction with IVE. Participant 2 indicated satisfaction with IVE according to her responses on the IVE Feedback Form, which she completed several months after her second IVE session. On a scale from 1 to 7, the participant assigned a 6 to the item asking about the extent to which exposure added to the effectiveness of therapy, a 5 to whether it added to the efficiency of therapy, and a 6 to the extent to which it increased her confidence to handle a variety of situations. She also indicated that the challenging nature of IVE was valuable, assigning a 7 to the statement: "The *most helpful* in vivo exposure sessions have been the ones that *challenged me the most*."

In response to the open-ended questions on the IVE Feedback Form, Participant 2 reported appreciating the naturalistic quality of the IVE sessions, such as involving IVE therapists she had not met prior to the exposure, and individualizing the critical comments she received to be relevant to the situations and people she encountered in her life. The participant indicated that her IVEs provided a "safe space" to practice responses, categorized her fears into manageable treatment targets, and made difficult situations easier to handle.

Participant 3

Demographics and clinical characteristics. Participant 3 was a young adult who received a diagnosis of OSFED, atypical AN from the CCBT-ED. Her BMI at intake was 21.5, with a reported high BMI of 24.1 and low adult BMI of 18.8. Although Participant 3 did not meet criteria for AN, her significant calorie restriction at the time warranted a diagnosis of OSFED, atypical AN. In addition to skipping meals, avoiding foods, and limiting portions, Participant 3 reported subjective binge eating episodes one to two times per week, with no history of objective binge eating, purging, or laxative abuse, and described significant body image dissatisfaction. Participant 3 stated that she began skipping meals in high school, and had since vacillated between periods of extreme restriction and more moderate dieting. She indicated that her restrictive eating was reinforced by her participation in an appearance-focused activity throughout her childhood and young adulthood. Participant 3 reported experiencing symptoms of depression and anxiety on an intermittent basis over the last three years. She received outpatient treatment from a university counseling center for several weeks before being referred to the CCBT-ED for more specialized eating disorder treatment. Her goals included reducing preoccupation with food, eliminating subjective binge eating, and improving body image.

At intake, Participant 3 obtained a score of 4.08 on the EDE-Q, more than one standard deviation above the normative mean and between the 40th and 50th percentiles of patients with eating disorders. Her BSQ-8 score of 36 was also one standard deviation above the mean of a community sample. Relative to a small sample of eating disorder patients, Participant 3's score of 39 on the Anxiety about Eating subscale of the FOFM was just under one standard deviation below the mean, while her score of 53 on the Feared Concerns subscale matched the clinical sample mean. Her score of 20 on the Food Avoidance Behaviors subscale was within one standard deviation of the mean of a small sample of healthy controls. The participant rated all of the scenarios on the IVESS at SUDS levels of 60 or greater.

CBT interventions and treatment outcomes. Participant 3 received a total of 34 CBT and two IVE sessions over a period of 187 days before moving to a different city. Following her move, she participated in three brief phone sessions. Consistent with CBT protocols for eating disorders, food record reviews and in-session weight checks were included in the majority of the participant's treatment sessions (see Table 1). These interventions explored and addressed Participant 3's beliefs about the relationship between regular eating and weight gain. Over half of the participant's CBT sessions also involved cognitive interventions for concerns related to her eating disorder, particularly her fear of negative judgment from others about her eating behaviors and her avoidance of eating in social situations. Additionally, Participant 3 indicated that the appearance-related activity in which she participated was an important aspect of her identity, and expressed ongoing ambivalence about giving up calorie restriction and gaining even a small amount of weight to achieve full recovery from her eating disorder. As a result of this ambivalence, most of the participant's CBT sessions included interventions that focused on

enhancing her motivation for change, such as exploring the benefits and drawbacks of her eating disorder symptoms.

Participant 3's weight fluctuated within a range of 10 lbs. throughout the course of treatment. During her final in-person CBT session, the participant was 2 lbs. heavier than her weight at intake. Although Participant 3's BMI of 21.8 at discharge was within a healthy weight range, she continued to consume a moderately restrictive diet. The participant's primary therapists believed that she would have benefited from additional treatment at the CCBT-ED to help her achieve full recovery, which would have likely required some weight gain.

The participant did not report objective binge eating, subjective binge eating, or purging while receiving services from the CCBT-ED. Her scores on the EDE-Q progressively reduced over the course of treatment, reaching 2.53 at the time of termination, which is one standard deviation of the mean of healthy women. Her BSQ-8 score of 35 at discharge was similar to her score at intake. Her scores on the three FOFM subscales were lower at discharge relative to intake: she received a 25 on the Anxiety about Eating subscale, a 34 on the Feared Concerns subscale, and a 15 on the Food Avoidance Behaviors subscale.

Participant 3 also completed the EDE-Q and BSQ-8 approximately three months after her final in-person session at the CCBT-ED. At three-month follow-up, she obtained a score of 2.36 on the EDE-Q and 27 on the BSQ-8, both of which were within one standard deviation of the mean of healthy women.

IVE and related outcomes. Throughout treatment, Participant 3 expressed significant anxiety about eating in social situations and avoided eating in front of other people. For example, she reported concerns that others would judge her negatively if she ate foods that others

might consider unhealthy or fattening. She also exhibited fear of violating standards for polite eating, such as offending others by eating in a messy or noisy way. When discussing possible scenarios for her first IVE, Participant 3 was reluctant to target concerns about improper eating, and requested that a less challenging exposure be planned. For her first IVE, the participant agreed to eat lunch with an unfamiliar person whom she was meeting for the first time.

During this IVE, the participant purchased a sandwich for lunch, met an IVE therapist on the university's campus, and ate her lunch while conversing with the IVE therapist who was not eating anything. The IVE therapist was instructed to maintain a friendly demeanor during the exposure. Participant 3 reported a SUDS of 80 at the start of the IVE session, which reduced to a 50 by the end of the exposure and a 40 five minutes after completing the IVE.

Following this first IVE, the participant expressed increased willingness to set up a more challenging exposure session to increase her self-efficacy for eating non-diet foods in front of other people. She agreed to participate in a difficult IVE designed to amplify these fears by meeting an unfamiliar IVE therapist who would make critical comments about a calorie-dense food item that the patient was eating. During multiple CBT sessions prior to this second IVE, Participant 3's primary therapists reviewed the rationale for this challenging exposure, practiced alternative ways of responding to critical comments, and highlighted connections between the patient's ability to take on difficult situations and her personal values and goals.

For her second exposure session, the participant met a new IVE therapist for lunch at an outdoor table located on campus. After the details of the session were reviewed, Participant 3 purchased and ate a burrito as planned, while the IVE therapist did not eat anything. As they conversed, the IVE therapist made intermittent comments about the calorie and fat content of the

burrito (e.g., “Wow, that looks like it has a lot of sour cream in it!” “I wonder how many calories are in one burrito?”) and about the participant’s choice to eat a calorie-dense food in view of her success in an appearance-focused activity (e.g., “I’m surprised that someone [involved in X] would feel comfortable eating food like that”). Participant 3 reported a SUDS of 90 at the start of the exposure session, which progressively reduced to a rating of 65 by the end and increased slightly to 70 five minutes later. When debriefing with the IVE therapist, the participant indicated that the exposure was more challenging that she had expected. She agreed to adhere to her meal plan for the rest of the day and discuss her thoughts about the IVE in more detail with her primary therapists.

During her next CBT session, Participant 3 expressed that she had been ruminating for several days about the comments made during the IVE, and reported uncertainty about whether the exposure session was helpful. Participant 3 and her primary therapists reviewed the rationale of the IVE and general importance of reducing anxiety and increasing self-efficacy in eating-related social situations. The primary therapists hypothesized that additional IVE sessions targeting the participant’s concerns in social situations would be valuable. Unfortunately, soon after the second IVE, Participant 3 terminated treatment when she moved to a different city.

Visual inspection of SUDS. Figure 6 presents Participant 3’s SUDS ratings of two TVs (eating a meal with an unfamiliar person and receiving critical comments about a meal) and one UV (eating when not hungry) throughout treatment. According to visual inspection of mean, the SUDS ratings of TVs reduced following both IVE sessions. The mean SUDS rating of the TV of eating a meal with an unfamiliar person was slightly lower following the first IVE relative to the mean SUDS in the session before this IVE. Similarly, both TVs exhibited lower mean SUDS

Figure 6. Participant 3's SUDS ratings of three situations over the course of treatment: (1) eating a meal with an unfamiliar person, (2) receiving critical comments about a meal that she is eating, and (3) eating a meal when not hungry.

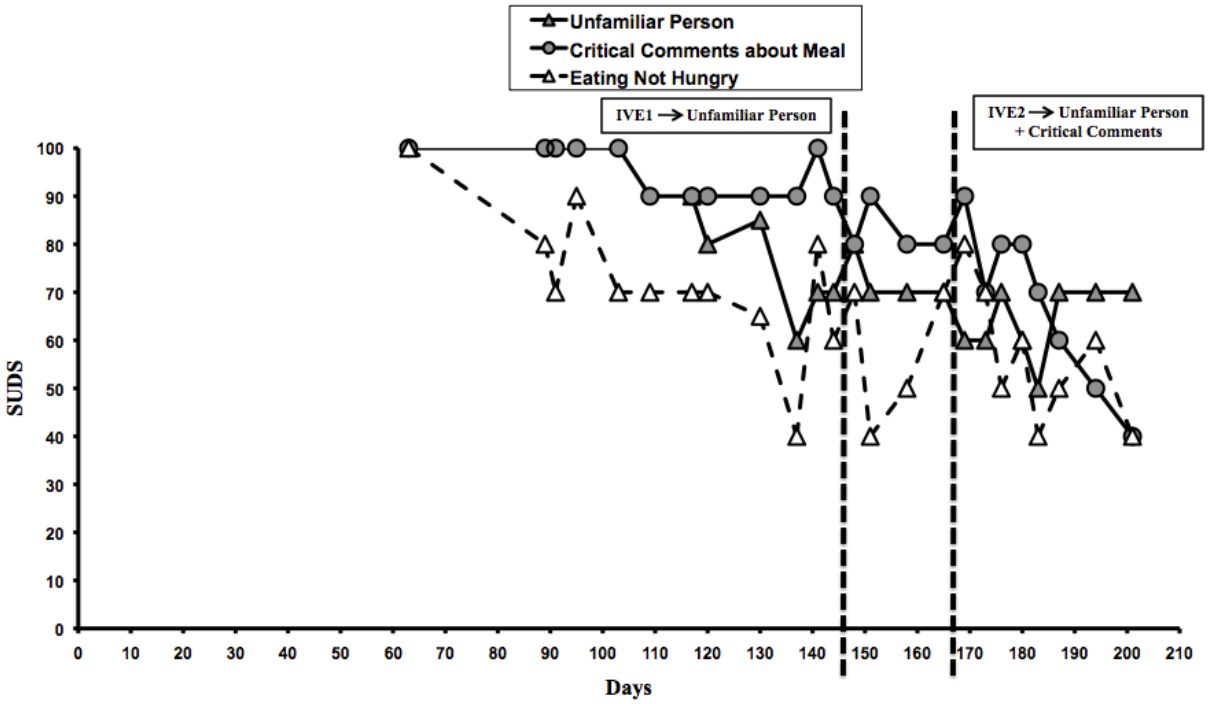

Figure 6 Note. Higher ratings indicate more distress. Ratings were obtained at the start of each CBT session. The vertical dashed lines represent when the patient participated in her first and second IVE session. The first IVE session targeted anxiety related to eating a meal with an unfamiliar person. The second IVE targeted anxiety related to both eating a meal with an unfamiliar person and receiving critical comments about a meal that she was eating.
SUDS = Subjective units of distress
IVE = *In vivo* exposure

scores following the second IVE when compared to the mean SUDS before this exposure session. The UV also exhibited a decrease in mean SUDS following the first IVE. After the second IVE, the overall mean SUDS of the UV was slightly higher than the mean SUDS from the several sessions before the second IVE.

Inconsistent with the study's hypothesis, there was an increase in SUDS level of the TV following the first IVE. Additionally, one of the TVs – receiving critical comments about a meal

– demonstrated an increase in SUDS following the second IVE. The other TV – eating a meal with an unfamiliar person – exhibited a decrease in level following the second IVE. There was an increase in the SUDS of the UV in the session after both IVEs. Both the TV and UV demonstrated an increase in trend following the first IVE, while both TVs and the UV exhibited a decrease in trend after the second IVE. Given the inconsistent changes in SUDS following IVE sessions and the overall reduction in all three variables over time, it cannot be concluded that exposure led to reductions in SUDS of TVs.

Statistical analyses of SUDS. When exploring changes within the short phases before and after the first IVE, ALLISON-MT produced an adjusted R^2 of zero for both the TV and UV (see Table 2). In the long phases, a negative adjusted R^2 was obtained for the TV, while a value of zero was calculated for the UV. For the second IVE, all variables examined within short and long phases using ALLISON-MT yielded adjusted R^2 values of zero.

As noted in Table 2, a negative within-subjects Cohen's *d* was obtained for the TV when focused on the short phases before and after the first IVE. In the long phases, a larger positive within-subjects Cohen's *d* was found for the UV than the TV. Consistent with the study's hypotheses, both TVs exhibited positive effect sizes while the UV had a negative effect size when examining SUDS before and after the second IVE.

Visual inspection of self-efficacy ratings. Figure 7 illustrates Participant 2's self-efficacy ratings throughout her treatment at the CCBT-ED. Although the TV exhibited an increase in mean self-efficacy following the first IVE, mean self-efficacy ratings of the UV also increased. While her mean self-efficacy ratings of one TV (receiving critical comments) increased following the second IVE, the other TV (eating with an unfamiliar person) exhibited a

Figure 7. Participant 3's self-efficacy ratings of three situations over the course of treatment: (1) eating a meal with an unfamiliar person, (2) receiving critical comments about a meal that she is eating, and (3) eating a meal when not hungry.

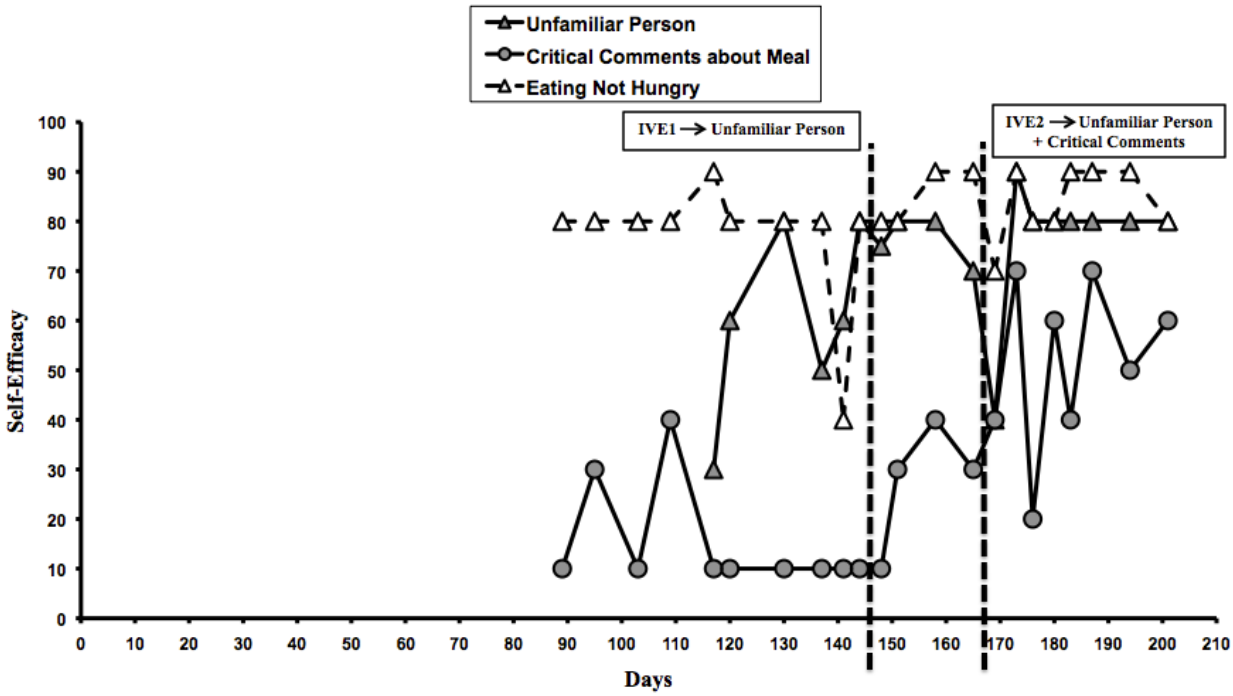

Figure 7 Note. Higher ratings indicate greater self-efficacy. Ratings were obtained at the start of each CBT session. The vertical dashed lines represent when the patient participated in her first and second IVE session. The first IVE session targeted self-efficacy related to eating a meal with an unfamiliar person. The second IVE targeted self-efficacy related to both eating a meal with an unfamiliar person and receiving critical comments about a meal that she was eating. IVE = *In vivo* exposure

decrease in mean self-efficacy ratings, which appears related to the considerable reduction in self-efficacy in the CBT session after her IVE. Although the lack of an increase in mean self-efficacy ratings of the UV following the second IVE is consistent with the study's hypothesis, this could be due to a ceiling effect.

Visual inspection of level yielded inconsistent results. Self-efficacy ratings of the TV decreased in the session after the first IVE. There was no change in the self-efficacy ratings of the UV following the first IVE. While the TV of receiving critical comments exhibited an

increase in self-efficacy level after the second IVE, the TV of eating a meal with an unfamiliar person illustrated a decrease in self-efficacy level. Participant 3's self-efficacy rating of the UV decreased from the CBT session before to the CBT session after her second IVE.

Results from visual inspection of trend generally did not support the study's hypotheses. Following the first IVE, the slope of self-efficacy ratings increased for the TV and decreased for the UV. After the second IVE, the participant's slope of self-efficacy ratings of one TV (eating with an unfamiliar person) increased while the slope of the other TV (receiving critical comments) decreased. The self-efficacy slope of the UV increased following the second IVE. Overall, visual inspection of changes in mean, level, and slope of self-efficacy ratings did not support the study's hypotheses, as there were inconsistent changes across all variables.

Statistical analyses of self-efficacy ratings. As shown in Table 3, ALLISON-MT yielded adjusted R^2 values near, at, or below zero for all variables when investigating effects of the first and second IVE in both the short and long phases.

The TV and UV examined before and after the first IVE yielded positive within-subject Cohen's *d* effect sizes of similar magnitude within the short and long phases (see Table 3). Consistent with results from visual inspection of the mean before and after the second IVE, positive within-subject Cohen's *d* effect sizes were obtained for the TV of receiving critical comments about a meal, while negative *d*s were found for the TV of eating a meal with an unfamiliar person. For the UV during the second IVE, negative within-subjects Cohen's *d*s were found.

Satisfaction with IVE. Participant 3 completed an IVE Feedback Form by her therapists' request approximately three months after moving away and ending treatment with the

CCBT-ED. Despite her reported uncertainty about the value of exposure following her second IVE, the participant reported general satisfaction with exposure on her IVE Feedback Form. She indicated that IVE sessions added to the effectiveness and efficiency of treatment (with 6 out of 7 ratings for both items), and that she is more confident in her ability to handle a variety of eating and weight-related situations because of IVE (with a rating of 7). Her rating of 5 suggests modest agreement to the statement that the most challenging IVE sessions were the most helpful.

Participant 3's responses to the open-ended questions indicated that she appreciated the collaborative process of developing exposure sessions, having the opportunity to address her fears in a more controlled environment, and debriefing following IVE sessions. The participant reported that exposure sessions were challenging and pushed her to address situations she was avoiding. She described the second IVE session as "too much too soon," noting that the exposure was more challenging that she had expected and that she was unprepared for the thoughts and emotions she experienced afterwards. Participant 3 indicated that she "absolutely" thinks future clients should participate in exposure sessions.

Participant 4

Demographics and clinical characteristics. Approximately four months before starting treatment at the CCBT-ED, Participant 4 sought outpatient treatment for objective binge eating at a medical center, and received treatment from a therapist who worked simultaneously at the CCBT-ED. When assessed by this therapist at the medical center, Participant 4 received diagnoses of BED, generalized anxiety disorder, and social anxiety disorder. Additionally, her BMI was approximately 49.0, the patient indicated that this was her highest weight ever, and expressed interest in receiving support with weight management. After more than one month of

treatment at the medical center, she had steadily lost weight and successfully stopped objective binge eating, but continued to report significant anxiety about situations related to eating, weight, and shape, as well as impairment related to social anxiety. After the medical center abruptly discontinued their eating disorders program, both the participant and her therapist decided to transition her outpatient treatment to the CCBT-ED clinic.

When assessed at the CCBT-ED, Participant 4 received a diagnosis of BED, in full remission, generalized anxiety disorder, and social anxiety disorder. She was an adult patient with a BMI of 47.0 at intake, with a reported low BMI of 19.8 at her present height. Although she was no longer experiencing objective binge eating, she was interested in continuing treatment to maintain her treatment gains, get further support with weight management, and address subjective binge eating, discomfort and avoidance of eating around other people, and significant body dissatisfaction. She denied ever purging or using laxatives. Participant 4 reported receiving prior psychotherapy for depression and social anxiety.

At the time of assessment at the CCBT-ED, Participant 4 obtained a score of 3.34 on the EDE-Q, which was between one and two standard deviations above the mean of healthy controls and between the 20^{th} and 30^{th} percentiles of patients with eating disorders. Her score of 40 on the BSQ-8 was precisely two standard deviations above the mean of a normative sample of women, suggesting significant body dissatisfaction. Compared to a small sample of healthy controls, her score of 9 on the Feared Concerns subscale of the FOFM was less than one standard deviation below the mean. Her score of 21 on the Anxiety about Eating subscale and 27 on the Food Avoidance Behaviors subscale were greater than two standard deviations above the mean of a healthy sample, and less than two standard deviations below the mean of a small clinical

sample. She rated just over half of the various eating, weight, and shape situations listed on the IVESS with a SUDS rating of 50 or greater, and nine scenarios received a SUDS rating of 100.

CBT interventions and treatment outcomes. Participant 4 received a total of 34 CBT and one IVE session at the CCBT-ED before moving to another state. Almost all of her CBT sessions included interventions related to self-monitoring and meal planning, and more than half incorporated psychoeducation and in-session weigh-ins (see Table 1). The participant regularly completed food records and planned meals with her primary therapist in CBT sessions. Psychoeducation about regular eating and healthy approaches to dieting often accompanied meal planning, as the therapist helped the participant develop a balanced diet that supported weight management while simultaneously reducing her susceptibility to binge eating. The 41% of CBT sessions including cognitive interventions and 50% including behavioral interventions for ED concerns often focused on Participant 3's anxiety about eating in social situations, such as challenging negative predictions about eating situations and attempts to set up exposure sessions targeting these concerns. Additionally, almost all of Participant 4's CBT sessions included cognitive and behavioral interventions for concerns other than her eating disorder, which typically addressed social anxiety, generalized anxiety, and emotion regulation.

Over the course of her treatment at the CCBT-ED, the participant lost and then regained approximately 15 lbs., remaining below her high lifetime BMI of 49.0. Participant 4 reported experiencing just one subjective binge-eating episode and denied ever engaging in objective binge eating while receiving treatment. Although her score on the EDE-Q reduced by 1.06 points on the second administration of this measure 90 days into treatment, her score progressively increased on the third and fourth administrations, which occurred 139 and 159

days into treatment, respectively. Her fourth (and final) EDE-Q score of 3.37 was almost identical to her intake score of 3.34. Similarly, the participant's score on the BSQ-8 exhibited a reduction on the second administration, followed by a progressive increase on the third and fourth administrations. Her final BSQ-8 score of 43 was three points higher than her initial score on this instrument. Participant 4 received a final score of 29 on the Anxiety about Eating subscale, 32 on the Feared Concerns subscale, and 8 on the Food Avoidance Behaviors subscale. The participant's initial improvement on self-report measures, particularly the BSQ-8, may be related to her weight loss during the first three months of treatment. Similarly, subsequent weight regain may have contributed to worsening scores on these measures.

IVE and related outcomes. Participant 4 reported significant fear about eating in front of other people, and avoided going to social events where she would be expected to eat. She expressed concerns that other people monitor and negatively judge her eating behaviors, and worried about eating foods that might draw attention (e.g., eating food that is messy or noisy). Two months after starting treatment at the CCBT-ED, the participant's primary therapist introduced the idea of IVE to address her anxiety and avoidance of eating in social situations. The participant reported that she was very anxious about participating in exposure treatment, and was resistant to even relatively straightforward IVEs such as eating while having a friendly conversation with an unfamiliar IVE therapist. After reviewing the rationale for exposure, attempting to increase the participant's motivation to participate, and discussing various possibilities for an IVE, Participant 4 agreed to an IVE in which she would eat a noisy food item while having a casual conversation with her primary therapist. It was expected that this would be the first of several exposure sessions that would increase in difficulty over time.

As planned, this IVE took place in a treatment room at the clinic with Participant 4 bringing a bag of crackers to the session. After reviewing goals, the participant began eating while carrying on a casual conversation with the primary therapist. Participant 4 reported a SUDS rating of 65 at the start of the IVE, which increased to a high of 82 during the IVE. At the end of the IVE, she reported a SUDS rating of 80, decreasing to 50 when assessed 15 minutes after the session had ended. When debriefing with her therapist afterwards, the participant stated that the IVE was even more anxiety-provoking than she had anticipated. Although the participant reported that she disliked the IVE, the significant difficulty she had with the IVE indicated to the primary therapist that additional exposure sessions would be particularly desirable for this patient. Unfortunately, the participant abruptly relocated to a different state for occupational reasons, ending treatment with the CCBT-ED before additional IVEs could be conducted.

Visual inspection of SUDS. Figure 8 presents Participant 4's SUDS ratings for the TV (noisy eating) and UV (receiving critical comments about a meal) throughout her treatment at the CCBT-ED. The final SUDS collected on day 187 were obtained during a final phone check-in with the participant almost one month after her last in-person CBT session. Overall, there were minimal changes in SUDS ratings of both the TV and UV over the course of treatment. Visual inspection of mean indicated that SUDS of both the TV and UV were slightly lower in the several sessions following the IVE. Similarly, both the TV and UV exhibited a slight reduction in SUDS ratings in level after the IVE. Visual inspection of slope indicated that SUDS of the TV changed from a small positive slope before the IVE to a small negative slope after the exposure session. In contrast, the slope of the UV changed from a small negative slope before

the IVE to a small positive slope after the exposure. Overall, similar reduction in SUDS ratings of the TV and UV precludes making any conclusions about the efficacy of this IVE at reducing Participant 4's SUDS ratings of the TV.

Figure 8. Participant 4's SUDS ratings of two situations over the course of treatment: (1) eating food in a noisy way and (2) receiving critical comments about a meal that she is eating.

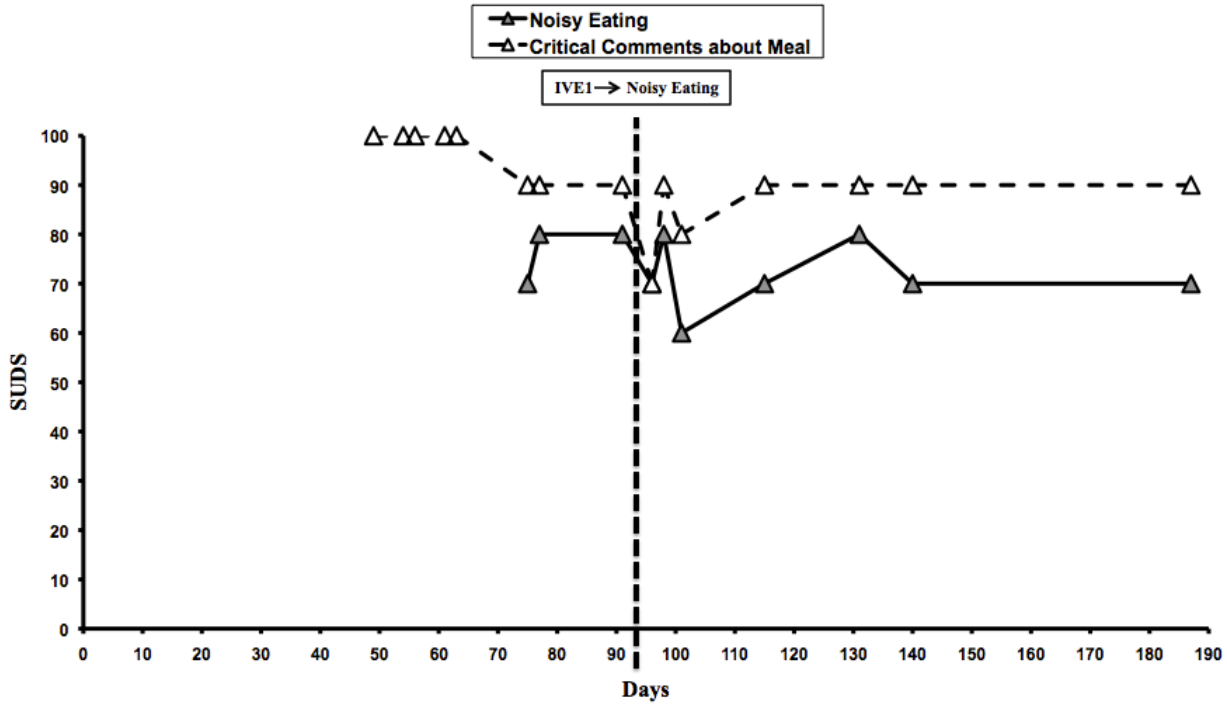

Figure 8 Note. Higher ratings indicate more distress. Ratings were obtained at the start of each CBT session. The vertical dashed line represents when the patient participated in an IVE session, which targeted anxiety related to eating food in a noisy way.
SUDS = Subjective units of distress
IVE = *In vivo* exposure

Statistical analyses of SUDS. Consistent with the small changes in slope observed using visual inspection, ALLISON-MT analyses resulted in adjusted R^2 values of zero for both the TV and UV when employing the short phase criteria (see Table 2). In the long phases, an adjusted R^2 value of zero was calculated for the TV and a positive value for the UV.

Due to the lower SUDS ratings of variables in the phase after the IVE relative to the phase before the exposure, positive within-subject Cohen's *d* effect sizes were found for both variables within the short and long phases.

Visual inspection of self-efficacy ratings. Figure 9 presents Participant 4's self-efficacy ratings of the TV and UV. In the CBT session immediately before the IVE, the participant reported a substantial increase in self-efficacy ratings for both variables. In contrast to stable baselines, this sharp positive trend just before the implementation of the IVE complicates the interpretation of changes in self-efficacy following the IVE. It is unclear whether reductions in self-efficacy following the IVE were due to the effects of the exposure session or a natural return to her baseline ratings. Visual inspection of mean, level, and trend did not support the hypothesis that the IVE resulted in an increase in self-efficacy ratings of the TV, as self-efficacy ratings of the TV decreased according to these three approaches. Moreover, the UV exhibited an increase in level and slight increase in mean self-efficacy ratings. Like the TV, the UV changed from a positive slope in the phase before the IVE to a negative slope in the phase after the exposure session.

Statistical analyses of self-efficacy ratings. As noted in Table 3, ALLISON-MT produced negative adjusted R^2 values for the TV and UV within the short and long phases.

Consistent with results from visual inspection of the mean, within-subjects Cohen's *d* effect sizes were negative for the TV and positive for the UV within both the short and long phases.

Satisfaction with IVE. According to her responses on the IVE Feedback Form, Participant 4 indicated dissatisfaction with the exposure session. She responded to all Likert

Figure 9. Participant 4's self-efficacy ratings of two situations over the course of treatment: (1) eating food in a noisy way and (2) receiving critical comments about a meal that she is eating.

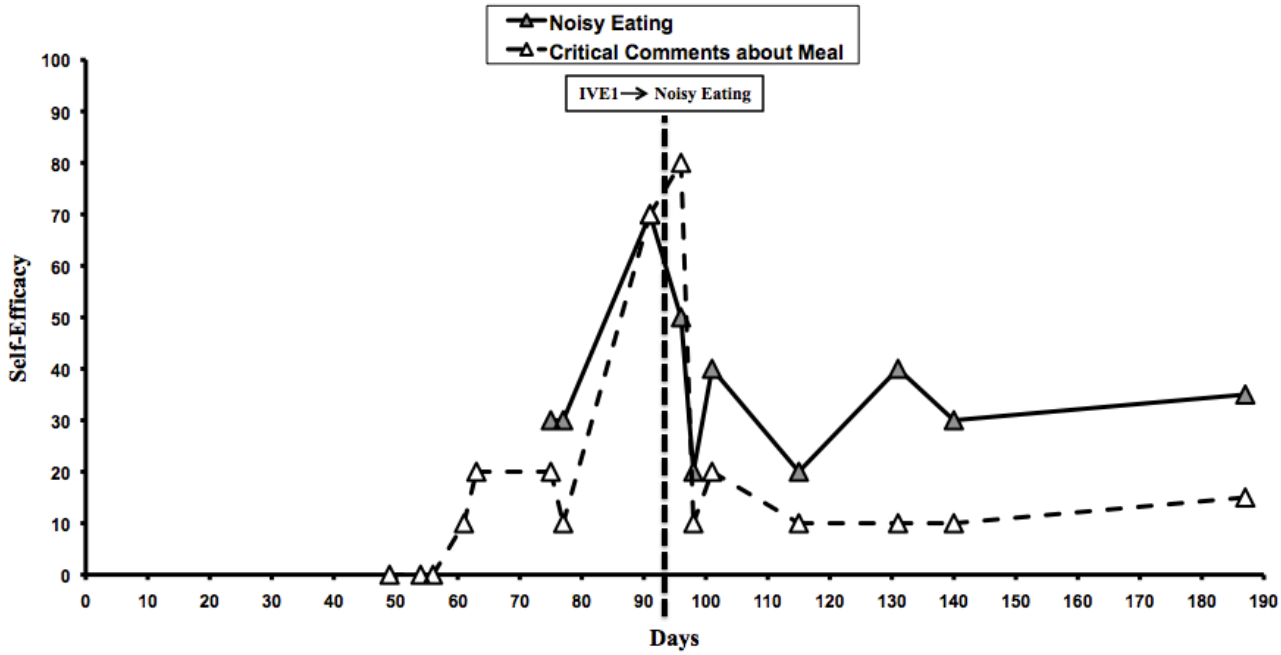

Figure 9 Note. Higher ratings indicate greater self-efficacy. Ratings were obtained at the start of each CBT session. The vertical dashed line represents when the patient participated in an IVE session, which targeted self-efficacy related to eating food in a noisy way.
IVE = *In vivo* exposure

items with a rating of 1, suggesting that she strongly disagreed with the assertion that IVE added to the effectiveness of treatment, increased the efficiency of treatment, or helped increase her confidence in being able to handle a variety of situations related to eating, weight, and shape. In her responses to the open-ended questions, the participant described the exposure session as "fairly awful" and indicated that she "failed" the IVE. She noted that the IVE was too challenging, highlighted that her social eating issues are "deeply rooted," and led to "regressive binge-eating behavior." On the other hand, the participant also reported on the IVE Feedback Form that she understands the potential value of IVEs and thought that other patients could benefit from them.

Participant 5

Demographics and clinical characteristics. Participant 5 was an adolescent who received a diagnosis of OSFED, BN of low frequency from the CCBT-ED. Her BMI at intake was 22.8. She reported uncertainty about her highest or lowest weight, but denied ever experiencing significant weight fluctuations. She reported objective binge eating and purging an average of once every two weeks over the past two years. The participant noted that she had stopped purging approximately two months before her evaluation at the CCBT-ED and had not had an objective binge-eating episode in two weeks. The participant endorsed subjective binge-eating episodes, a strong desire to purge after eating certain meals, and significant fear and avoidance of foods she considered fattening or unhealthy. She reported sub-clinical symptoms of social anxiety and depression.

Participant 5 reported a global EDE-Q score of 1.54 at intake, which is within one standard deviation of the mean of a normative sample of young adult women and between the 5th and 10th percentiles of treatment-seeking females with eating disorders. Participant 5's initial BSQ-8 score of 20 matched the mean of a normative sample of young adult women. Her score of 18 on the Feared Concerns subscale and 15 on the Anxiety about Eating subscale of the FOFM were greater than one standard deviation above the mean of a small sample of healthy controls, and less than two standard deviations below the mean of a clinical sample. Her score of 8 on the Food Avoidance Behaviors subscale was less than one standard deviation below the mean of a healthy sample. She endorsed a SUDS greater than 50 for just over half of the 29 scenarios on the IVESS.

CBT interventions and treatment outcomes. Participant 5 continues to receive treatment from the CCBT-ED. The present study includes data from one IVE and 53 CBT sessions over 337 days. As noted in Table 1, over half of her CBT sessions included interventions related to psychoeducation, enhancing motivation, in-session weighing, self-monitoring and meal planning, cognitive interventions addressing disordered eating, and CBT for concerns other than her eating disorder. Many of these interventions worked in conjunction to explore and challenge the participant's beliefs about the relationship between the consumption of feared foods and weight gain, as well as to facilitate the reintroduction of foods she perceived as unhealthy into her diet. Treatment also targeted her fears of eating in social situations, investment in treatment, and completion of food and thought records between treatment sessions. CBT interventions that were unrelated to the participant's eating disorder often focused on thoughts, behaviors, and emotions related to life stressors, depressed mood, and social anxiety.

Participant 5 reported one purging episode within the first month of treatment, and no purging afterwards. Over the course of treatment, the participant indicated experiencing 22 subjective binge-eating episodes, but no objective binge eating. Participant 5 used inconsistent criteria to define a subjective binge-eating episode, and included eating accompanied by any feeling of loss of control, eating a meal that she considered large, and/or consuming food that she felt was too high in fat or calories. She gained approximately 9 lbs. during the first three months of treatment, and has maintained a BMI of 24.4 since that time.

Similar to her score at the time of assessment, Participant 5's most recent EDE-Q score of 2.44 was within one standard deviation of the mean of a healthy sample, and between the 10^{th} and 15^{th} percentiles of treatment-seeking females. Her BSQ-8 score also remained relatively

stable throughout treatment; her final score on this measure was 23. Participant 5's scores on the three subscales of the FOFM increased slightly from intake, although all were more than two standard deviations below the mean of a small sample of patients with eating disorders. She received a score of 23 on the Anxiety about Eating subscale, 15 on the Food Avoidance Behaviors subscale, and 26 on the Feared Concerns subscale. While it is possible that the slight increases in Participant 5's scores on the EDE-Q, BSQ-8, and FOFM subscales indicate worsening eating disorder symptoms over time, these small changes may instead reflect regression to the mean, mild fluctuations in the severity of her eating disorder symptoms, increased awareness of her symptoms, and/or improved understanding of the constructs measured by these questionnaires.

IVE and related outcomes. Despite Participant 5's sustained abstinence of purging and objective binge eating throughout the first few months of treatment, she continued to express significant fear and disordered thinking related to eating foods that violated certain dietary rules and/or health guidelines, as well as eating in front of other people. Approximately six months into treatment at the CCBT-ED, the participant and her primary therapists began planning what they anticipated to be the first of several IVE sessions targeting these concerns. Participant 5 stated that she was very anxious about eating with someone she had never met before, and requested that the first IVE include a food item that was not too challenging. The participant and her primary therapists collaboratively decided that she would eat a large slice of vegan pizza, which she rated with a SUDS of 65. They also agreed to target the participant's fear of eating a meal that is larger and/or higher in calories and fat than a meal being eaten by another person. To address this issue, Participant 5 and her primary therapists decided that the IVE therapist

would bring a relatively small portion of food to eat for herself.

During the IVE, Participant 5 purchased a slice of vegan pizza for lunch from a grocery store with an eatery, and sat at a table with an IVE therapist she was meeting for the first time. The IVE therapist brought one breadstick for herself to eat. Participant 5 and the IVE therapist had a friendly conversation, and the IVE therapist noted that the participant appeared to become more relaxed over the course of the 30-minute session. The participant's SUDS rating reduced from 60 five minutes before the start of the IVE to 50 by the beginning of the exposure session, remained at 50 for the rest of the IVE, and reduced to 40 seven minutes after the end of the IVE.

In the following CBT session, the participant indicated to her primary therapists that the IVE was not as difficult as she had expected, although she was uncertain if the IVE contributed to any changes in her anxiety or self-efficacy about eating in social situations. While discussing potential foods and scenarios to target in a second IVE session, the participant exhibited difficulty identifying what thoughts contributed to her anxiety. The primary therapists thus shifted focus in CBT sessions to help Participant 5 better understand her thoughts and beliefs about food, dietary rules, and eating in social situations, and decided to hold off on conducting additional IVE sessions until the participant developed improved insight into her own cognitions.

Visual inspection of SUDS. Figure 10 presents Participant 5's SUDS ratings for two TVs (vegan pizza and eating a larger meal than another person) and one UV (wearing tight clothing around others). Visual inspection of mean and level were consistent with the present study's hypotheses, as both TVs exhibited decreases in SUDS in the CBT session immediately after the IVE and during the multiple CBT sessions following the IVE, while SUDS of the UV remained relatively stable before and after the IVE. Ratings for vegan pizza exhibited a decrease

in slope in SUDS following the IVE, while the slope in SUDS ratings for eating a larger meal than another person was roughly the same before and after the IVE. The generally stable pattern of SUDS of the UV before the IVE did not change following the IVE.

Figure 10. Participant 5's SUDS ratings of one food and two situations over the course of treatment: (1) vegan pizza, (2) eating a larger meal than someone else she was eating with, and (3) trying on tight clothing around others.

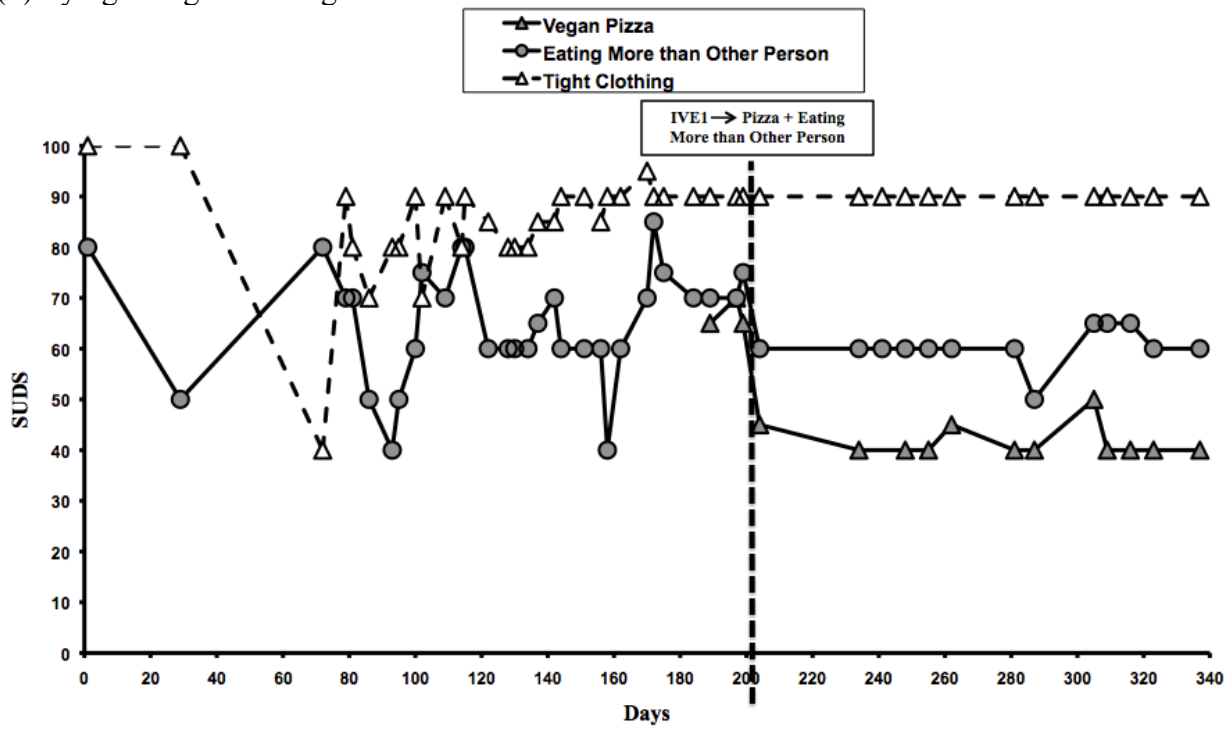

Figure 10 Note. Higher ratings indicate more distress. Ratings were obtained at the start of each CBT session. The vertical dashed line represents when the patient participated in an IVE session, which targeted anxiety related to eating vegan pizza and eating a larger meal than another person she was eating with.
SUDS = Subjective units of distress
IVE = *In vivo* exposure

Statistical analyses of SUDS. For the TV of vegan pizza, ALLISON-MT analyses exploring changes within the short and long phases produced some of the largest positive adjusted R^2 values in present study (see Table 2). Increasing confidence that the IVE contributed to changes in the TVs are the small adjusted R^2 values obtained for the UV (a value for the UV

from the short phase could not be calculated due to the lack of variability in SUDS).

Relatively large positive Cohen's *d* values were obtained for the two TVs within the short and long phases (see Table 2). As hypothesized, the UV did not exhibit a reduction in mean SUDS following the IVE, resulting in a negative *d* within the long phases.

Figure 11. Participant 5's self-efficacy ratings of one food and two situations over the course of treatment: (1) vegan pizza, (2) eating a larger meal than someone else she was eating with, and (3) trying on tight clothing around others.

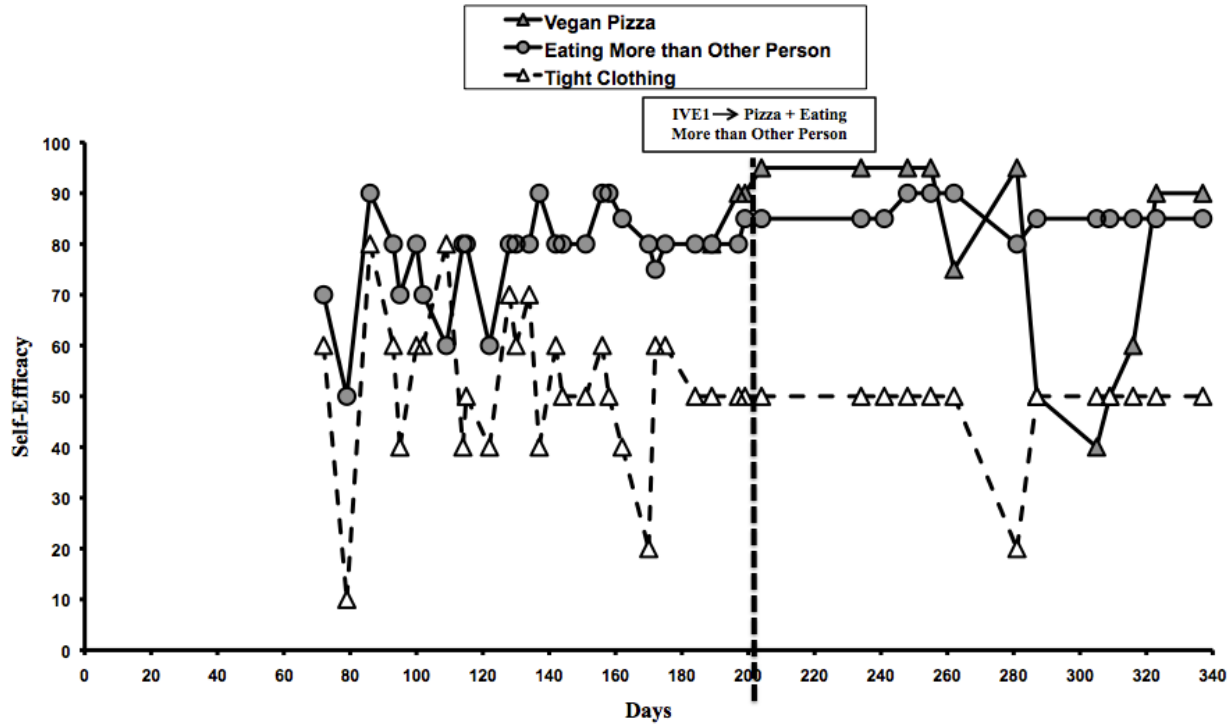

Figure 11 Note. Higher ratings indicate greater self-efficacy. Ratings were obtained at the start of each CBT session. The vertical dashed line represents when the patient participated in an IVE session, which targeted self-efficacy related to eating vegan pizza and eating a larger meal than another person she was eating with.
IVE = *In vivo* exposure

Visual inspection of self-efficacy ratings. Figure 11 illustrates Participant 5's self-efficacy ratings of the two TVs and one UV. Visual inspection of the mean indicated minimal

increases in self-efficacy ratings of both TVs, which may be due to ceiling effects: both TVs were rated with a self-efficacy score greater than 80 in the CBT session before the IVE. Visual inspection of level indicated an increase in self-efficacy level for the TV of vegan pizza, but not the TV of eating more than another person. The self-efficacy score of 50 for the UV remained the same during the several CBT sessions before and after the IVE. Visual inspection of trend of Participant 5's self-efficacy data did not support the present study's hypotheses. Perhaps due to ceiling effects, slopes of the TVs did not increase following the IVE.

Statistical analyses of self-efficacy ratings. Results form ALLISONT-MT for Participant 5 generally did not support the study's hypotheses. As noted in Table 3, ALLISON-MT often produced values at or below zero for the two TVs.

In contrast, results from within-subject Cohen's *d* effect sizes tended to support the present study's hypotheses. Although a negative *d* was found for the TV of vegan pizza within the long phases, this negative value appeared to be due to temporary decreases in the participant's self-efficacy score several sessions after the IVE (see Figure 11). A positive *d* was found for the vegan pizza variable within the short phases. Positive Cohen's *d*s were calculated for the TV of eating more than another person within the short and long phases, while a negative *d* was found for the UV within the long phases (a *d* could not be calculated for the short phases).

Satisfaction with IVE. Participant 5's responses on the IVE Feedback Form indicated that she did not find the IVE session to be particularly helpful. She responded to the Likert items with a rating of 4, suggesting that she neither agreed nor disagreed with the statement that IVE added to the effectiveness of treatment, increased the efficiency of treatment, or helped increase her confidence in being able to handle a variety of eating-related situations. She noted in

response to open-ended questions that the IVE went better than she had expected, and had appreciated that her therapists worked with her to choose an exposure situation that was not too challenging for her first session. On the other hand, she also expressed that the IVE session may not have been challenging enough, and indicated that she could not completely remember the purpose of the IVE. While Participant 5 stated that she does not feel passionately about whether future patients should participate in IVE sessions, she noted that IVE sessions seem to have the benefit of committing patients to actually making a change or partaking in a challenging situation that they could otherwise choose to avoid.

Results Across All Participants

In addition to results investigating each participant's ratings following IVE sessions, supplementary analyses explored findings across all five participants, including: (1) the relationship between TVs, UVs, and RVs, and (2) inter-rater reliability on the CCBT Checklist.

Exploring relationships between variables. In addition to changes in SUDS and self-efficacy ratings of TVs and UVs, participants' ratings of RVs were also examined via visual inspection to explore potential patterns of change over the course of treatment and in response to IVE sessions. Paralleling the data from TVs and UVs (see Figures 2 – 11), RVs typically exhibited a progressive decrease in SUDS and increase in self-efficacy ratings over time across the five participants. Moreover, RVs demonstrated a similar pattern as the TV(s): RVs typically increased when the TV(s) increased, and decreased when the TV(s) decreased. In other words, SUDS and self-efficacy data from TVs and RVs appeared correlated.

Table 4 presents Pearson's correlation coefficients (*r*) representing the relationship between SUDS of TVs, RVs, and UVs. For each TV, three correlation coefficients were

Table 4. Pearson's correlation coefficients (*r*) representing the relationship between distress ratings of target, unrelated, and related variables.

	Target Variable	Unrelated Variable	Related Variables	
			Lowest *r*	Highest *r*
Participant 1				
Item	Meal in Bathing Suit	Eating Not Hungry	Critical Comments Weight	Critical Comments Meal
Pearson's *r*		0.89	0.63	0.94
Item	Active in Bathing Suit	Eating Not Hungry	Critical Comments Meal	Critical Comments Weight
Pearson's *r*		0.35	0.24	0.76
Participant 2				
Item	Critical Comments Meal	Gym Around Others	Cake	Eating More than Other Person
Pearson's *r*		0.94	0.38	0.94
Participant 3				
Item	Unfamiliar Person	Eating Not Hungry	Gym Around Others	Fast-Food Restaurant
Pearson's *r*		0.41	0.43	0.66
Item	Critical Comments Meal	Eating Not Hungry	Fried Rice	Flatbread Sandwich
Pearson's *r*		0.61	0.13	0.71
Participant 4				
Item	Noisy Eating	Critical Comments Weight	Other Person Not Eating	Critical Comments Meal
Pearson's *r*		0.46	0.49	0.62
Participant 5				
Item	Vegan Pizza	Tight Clothing Around Others	Milkshake	Waffles
Pearson's *r*		--	-0.04	0.39
Item	Eating More than Other Person	Tight Clothing Around Others	Milkshake	Eating Large Meal
Pearson's *r*		-0.12	0.02	0.36

Table 4 Note. An *r* representing the correlation between vegan pizza and wearing tight clothing around others for Participant 5 could not be calculated due to lack of variability in the ratings of the latter variable.
r = Pearson's correlation coefficient

calculated, which represent the relationship between the SUDS of the TV and the: (1) UV, (2) RV with the lowest *r*, and (3) RV with the highest *r*. The considerable differences between the lowest and highest correlation coefficients within each participant except Participant 5 indicated that the extent to which RVs were correlated with the TV varied substantially. Moreover, UVs often exhibited a stronger correlation with the TV than some of the RVs. For example, Participant 2's SUDS of the TV (receiving critical comments about a meal she was eating) were highly correlated with her SUDS of the UV (working out at the gym around other people) (r = 0.94), despite the expectation that ratings of these two variables would not be closely related (Figure 4 provides a visual representation of this correlation). This correlation coefficient was similar to those obtained when analyzing the relationship between Participant 2's SUDS ratings of the TV and potentially related scenarios (e.g., eating a bigger meal than someone else, r = 0.94), and greater than those exploring the relationship between her SUDS of the TV and potentially related foods (e.g., cake, r = 0.38).

In general, each participant's SUDS and self-efficacy ratings of scenarios appeared to be more highly correlated with the TVs (all of which were also scenarios except for one of Participant 5's TVs) than their ratings of foods. After collapsing RVs and UVs into the same category, Pearson's correlation coefficients were calculated between the SUDS of each scenario TV and all other foods, and between each scenario TV and all other scenarios, for the four participants who provided SUDS for both foods and scenarios (Participant 4 only reported distress related to scenarios during treatment, and thus was not asked to provide SUDS ratings for foods). Mean scenario correlation coefficients were then calculated: r = 0.63 for Participant 1, r = 0.94 for Participant 2, r = 0.56 for Participant 3, and r = 0.08 for Participant 5. Mean food

Figure 12. Participant 2's mean SUDS ratings for all foods and scenarios measured over the course of treatment.

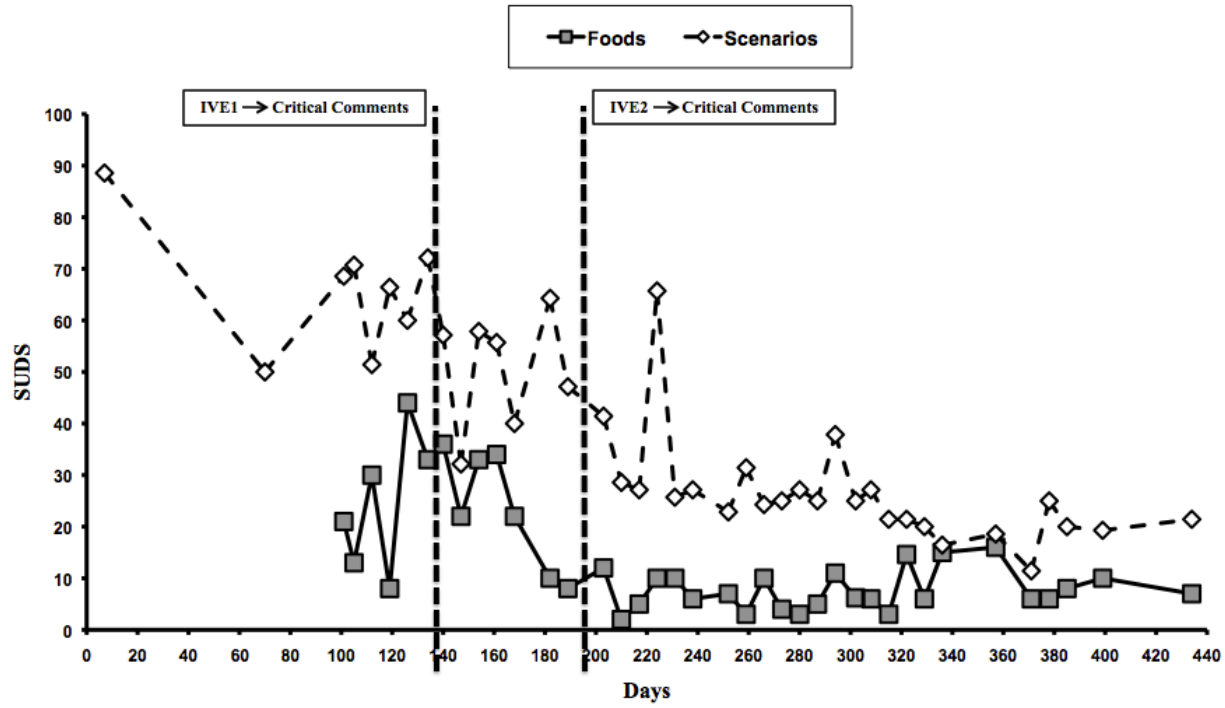

Figure 12 Note. Ratings were obtained at the start of each CBT session. The vertical dashed lines represent when the patient participated in her first and second IVE session.
SUDS = Subjective units of distress
IVE = *In vivo* exposure

correlation coefficients were derived using the same approach: $r = 0.71$ for Participant 1, $r = 0.49$ for Participant 2, $r = 0.34$ for Participant 3, and $r = 0.20$ for Participant 5. These results suggest that SUDS of TVs, all of which were scenarios, were more highly correlated with SUDS of other scenarios than SUDS of foods, with the exception of Participant 5. On the other hand, distress ratings of foods still yielded a moderate correlation with ratings of target scenarios.

To explore session-to-session variability in participants' ratings, a mean food SUDS rating was calculated at each CBT session by averaging SUDS ratings of all foods on each participant's short food hierarchy. A mean scenario SUDS rating from each CBT session was

Figure 13. Participant 2's mean self-efficacy ratings for all foods and scenarios measured over the course of treatment.

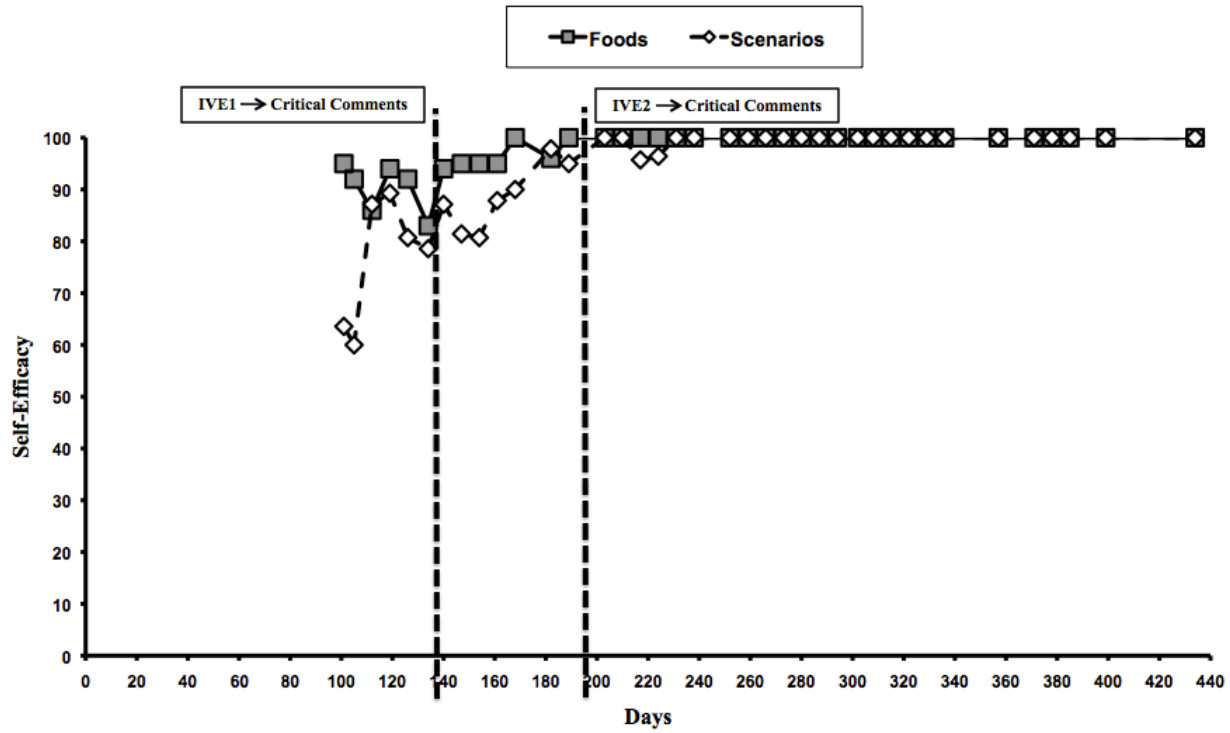

Figure 13 Note. Ratings were obtained at the start of each CBT session. The vertical dashed lines represent when the patient participated in her first and second IVE session.
IVE = *In vivo* exposure

also calculated by averaging all scenarios on the short scenario hierarchy. Additionally, mean food and scenario self-efficacy ratings were obtained using the same procedures. Figures displaying these mean scores were created for each participant and analyzed visually. Figures 12 and 13 present the results for Participant 2. Similar to the pattern observed in SUDS and self-efficacy ratings of specific scenarios over time (see Figures 2 – 11), the overall food and scenario ratings demonstrated variability from session to session. However, this variability was more modest when looking at mean scores rather than individual items. For example, while Figure 12 demonstrates that Participant 2 sometimes reported greater than 25-point changes in SUDS in

consecutive CBT sessions, the decreasing trend in SUDS over time appears steadier than the pattern of Participant 2's SUDS ratings of the individual variables illustrated in Figure 4.

Interrater reliability of CBT interventions. A Cohen's kappa coefficient (κ) of 0.63 was computed between the checklists completed by the primary investigator and therapists (when excluding the "other" option), indicating substantial agreement (Landis & Koch, 1977). A second Cohen's κ was calculated to evaluate interrater agreement related to whether or not at least one intervention from each category was employed in the CBT session. A κ of 0.66 was calculated when focusing on the inclusion of interventions from the broader categories, also suggesting substantial agreement.

Discussion

Exposure therapy has been evaluated as a treatment for eating disorders since the early 1980s (e.g., Rosen & Leitenberg, 1982), with most studies focusing on ERP for BN. More recently, scientist-practitioners have explored the efficacy of exposure for patients with other eating disorder diagnoses (e.g., Hildebrandt et al., 2013; Steinglass et al., 2014) and additional symptom patterns such as body dissatisfaction (e.g., Hildebrandt et al., 2012; Morgan et al., 2014; Trentowska et al., 2014). None of these investigations, however, have fully applied the principle of "overcorrection" when developing exposure sessions, with the exception of a case study describing imaginal exposure for AN (Levinson et al., 2014). The present study is the first to explore the impact of challenging therapist-assisted IVE sessions that address a wide range of eating, weight, and shape situations designed to amplify or exaggerate patients' fears.

Unfortunately, limitations related to the study's design and sample prohibit making conclusions about the efficacy of IVE, particularly due to the challenge of identifying comparison variables that are simultaneously relevant to eating disorder treatment and unrelated to the domains being targeted by IVE. Nevertheless, systematic and detailed information collected from each participant provided some clues about the utility and potential complications of adapting exposure treatment for this clinical population. Results suggest that at least some participants perceived challenging exposure sessions as valuable, which may encourage further research evaluating the efficacy of IVE for this population. Preliminary findings from the present study may also inform future research that could better answer whether IVE is an effective additive element to CBT for eating disorders.

Findings from the Multiple-Baseline Design

Changes in SUDS following IVE. The present study's primary hypothesis predicted a decrease in SUDS of a TV and no change or an increase in SUDS of a UV. With the exception of Participant 5's results, visual inspection and statistical analyses of SUDS did not support this hypothesis: while SUDS ratings of TVs often reduced following exposure, similar changes tended to occur in the UVs. Although the frequent reductions in SUDS ratings following IVE sessions may indicate that exposure is effective in reducing anxiety, the similar decreases in SUDS for variables that were presumed to be unrelated preclude conclusions about whether any changes were related to IVE. Decreases across all variables could be attributable to other factors, such as the non-exposure elements of CBT, time, regression to the mean, or individual patient variables unrelated to treatment.

In general, results from analyses using ALLISON-MT paralleled the findings from visual inspection of trend, both of which provided the least support for the present study's hypotheses. Visual inspection of trend examined the slope of the SUDS data before and after each exposure session. To support the study's primary hypothesis, the trend line following the IVE needed to exhibit a greater negative slope than the trend line prior to the IVE. However, participants were more likely to exhibit a greater negative reduction in SUDS toward the beginning of treatment, often creating sharper negative slopes prior to the first IVE session relative to the post-IVE slopes. Similarly, ALLISON-MT controls for decreasing trends in the pre-intervention phase when calculating an adjusted R^2 value. To demonstrate an effect, the data in the post-intervention phase must exhibit a greater decreasing trend than the pre-intervention phase trend. It appears likely that the decreasing trend in SUDS data over the course of CBT, particularly

toward the start of treatment, is at least partially responsible for the limited support of the study's primary alternative hypothesis via ALLISON-MT and visual inspection of trend.

Similar to the parallel between visual inspection of trend and results from ALLISON-MT, findings from visual inspection of mean converged with within-subject Cohen's *d* effect sizes. The convergence between these two approaches is likely due to the fact that both focus on change in mean scores of ratings before and after an IVE. Given that all variables tended to exhibit reductions over time, mean scores of SUDS of TVs and UVs were typically lower in the phase following an IVE than the phase before an IVE.

As general reductions in SUDS ratings over time make it difficult to interpret results from visual inspection of trend (along with ALLISON-MT) and mean (along with within-subject Cohen's *d*), visual inspection of level may be the most valuable measure of change following each IVE session. As inspection of level focused solely on the SUDS rating obtained in the CBT session before and after the IVE, results should be less susceptible to attenuation (as was the case with inspection of trend) or inflation (as was the case with inspection of mean). Consistent with this premise, participants were less likely to report reductions in SUDS and more likely to report increases or no change in SUDS from session to session before the first IVE occurred (see Figures 2 – 11). However, reductions in SUDS level of TVs following IVEs did not appear to occur more often than what might be expected by chance. Moreover, UVs exhibited decreases in SUDS level at a similar rate as TVs for all but Participant 5. Unfortunately, the lack of a clear distinction between changes in level of the TVs versus UVs for Participants 1 – 4 precludes making cause-and-effect conclusions about the efficacy of IVE at affecting SUDS ratings.

The most convincing evidence for the additive efficacy of IVE was observed with

Participant 5, who reported decreases in SUDS ratings of two TVs immediately after her IVE and relatively stable ratings of the UV. Interestingly, Participant 5 also exhibited the smallest correlations between TVs and other variables (see Table 4), which may indicate that this participant viewed the TVs as distinct from the UV, while the other four participants may not have differentiated distress about TVs from the selected UV. While Participant 5's SUDS data provide support of the primary hypothesis, it cannot be ruled out that these results are due to chance or other factors. The lack of replication of Participant 5's results across participants prohibits concluding that IVE contributes to reductions in SUDS ratings about various eating, weight, and shape situations.

Changes in self-efficacy ratings following IVE. Similar to the results from SUDS data, analysis of self-efficacy ratings using visual inspection of trend paralleled findings from ALLISON-MT, and visual inspection of mean converged with within-subject Cohen's *d* effect sizes. Overall, changes in self-efficacy ratings following IVE sessions were more modest than changes in SUDS. Visual inspection of trend and adjusted R^2 values from ALLISON-MT rarely supported the alternative hypothesis. While visual inspection of the mean and Cohen's *d* effect sizes often found that self-efficacy of TVs increased in the several following sessions following IVE, UVs also demonstrated greater post-IVE mean scores. Changes in the level of self-efficacy ratings of TVs following IVEs are similar to what would be expected by chance. Overall, the present study failed to provide convincing evidence that IVE sessions led to increases in self-efficacy for TVs.

Relationship between variables. The logic of the present study's multiple-baseline design depended on IVE specifically affecting TVs and *not* impacting UVs that were deemed

unlikely to be influenced by the IVE. For example, it was predicted that an IVE designed to address a participant's fear of receiving critical comments about a meal she was eating would not likely impact anxiety or self-efficacy about working out at the gym around others. In reality, most of the variables selected as "unrelated," as well as "related" items that were not targeted by IVE, exhibited modest to strong correlations with TVs (see Table 4). In general, SUDS ratings of TVs and UVs appeared to exhibit similar patterns over the course of CBT: as SUDS for one variable increased, SUDS for the other variables also tended to increase, and vice versa.

The correlation between TVs, UVs, and RVs may indicate that most participants perceived these different variables as part of the same broader construct. If this is the case, factors that impact one of these variables would be likely to affect the others. Alternatively, the therapeutic effects of IVE (and/or other aspects of treatment) may have generalized to a wide range of variables, impacting participants' ratings of all items on the short fear hierarchies. For example, an exposure session that decreased a participant's anxiety about people commenting on her food choices may have had cascading effects that led to reduced distress about eating feared foods, breaking dietary rituals, and participating in previously avoided activities due to body dissatisfaction. It may also be the case that patients are not sensitive to differences between their emotional responses to distinct eating, weight, and shape situations. Participants' ratings on the short fear hierarchies could represent broader feelings of anxiety and self-efficacy, such that greater anxiety and disordered thoughts and behaviors in general translates to higher SUDS and lower self-efficacy ratings across all items assessed on the fear hierarchies. Regardless of the specific reason(s), the correlations between TVs and UVs indicate that the selection of different types of eating, weight, and shape scenarios as comparison behaviors was a poor choice for the

present study's multiple-baseline design across behaviors, at least for four of the five participants.

Conclusions about the efficacy of IVE. In view of the limited support achieved for the primary hypothesis, it appears reasonable to conclude that IVE did not contribute to the efficacy of CBT for most participants. Patients tended to improve across all measures, including SUDS and self-efficacy ratings, throughout the course of treatment, and neither visual inspection nor statistical analyses provided convincing evidence that IVEs had a noticeable impact on this trend for Participants 1 – 4.

On the other hand, several alternative explanations should be considered. As noted earlier, the effects of IVE sessions may generalize to variables not specifically targeted by exposure, resulting in changes to both TVs and UVs. It is also conceivable that other factors, such as stressors in the participants' lives or other components of CBT, may have affected participants' ratings and obscured the effects of IVE sessions. Alternatively, IVE sessions may have delayed effects that could not be discerned from the changes occurring from CBT. It is also feasible that IVE might contribute to change in ways not captured by SUDS or self-efficacy ratings, such as by building resistance to relapse in the future. As each participant received only one to two IVE sessions, it is possible that a larger number of exposure sessions must be administered for IVE to demonstrate significant effects.

Taken together, the present study's inconsistent findings preclude conclusions about whether or not IVE is an effective treatment element of CBT for eating disorders. Additional research that better controls for confounding variables is necessary to draw more certain conclusions about the efficacy of IVE.

Other Findings Relevant to the Application of IVE for Patients with Eating Disorders

In addition to exploring the efficacy of IVE as an additive element to CBT for eating disorders, the present study provided a systematic, fine-grained look at how IVEs were conducted for five patients at the CCBT-ED. While results from the multiple-baseline design failed to support any clear conclusions about the efficacy of IVE, other pieces of information were obtained from the close examination of CBT with challenging exposure sessions across the study's five participants. Although small sample size precludes drawing any general conclusions from these exploratory findings, patterns in the data warrant comment and may inform future research.

Variability in SUDS and self-efficacy ratings. Participants demonstrated different degrees of variability in SUDS and self-efficacy ratings over the course of CBT. While some participants' ratings remained relatively stable, others' exhibited substantial fluctuations. Additionally, distinct patterns in SUDS and self-efficacy ratings were observed within each participant. For example, in the three CBT sessions prior to her second IVE, Participant 2's SUDS ratings of the TV of receiving critical comments changed from a 60 to 95 to 50 (see Figure 4). In contrast, her self-efficacy ratings for the TV during these three sessions were 85, 95, and 95 (see Figure 5). In other words, her self-efficacy ratings maintained a positive and stable trend even as her anxiety ratings fluctuated. These results suggest that Participant 2 experienced variable anxiety about certain situations while maintaining high confidence in her ability to handle these situations. Interestingly, the opposite pattern emerged with Participants 3 and 4, both of whom reported greater variability in self-efficacy than distress ratings.

The divergent patterns that often emerged between SUDS and self-efficacy ratings

suggest that distress and self-efficacy are distinct constructs. The possibility that self-efficacy ratings may provide information about treatment progress above and beyond SUDS should encourage researchers to measure self-efficacy as a treatment outcome in the future. Additional research might also explore whether changes in either distress or self-efficacy have a greater impact on treatment outcomes, as it is currently unclear if one of these two constructs is more important to target in treatment.

Overall, ratings were more stable when averaging across various items (see Figures 12 and 13), but still appeared to exhibit somewhat greater variability than SUDS ratings of items reported over time in children and adults with anxiety in other studies (e.g., Chorpita et al., 1997; Hayes & Barlow, 1977; Knox et al., 1996; Scemes et al., 2009). Further research is necessary to determine whether patients with eating disorders indeed exhibit more variability in SUDS ratings over the course of treatment than those with anxiety disorders.

The five participants also reported variable within-session SUDS ratings during exposure. For example, SUDS for Participants 1 and 4 increased substantially from their initial ratings at the start of the IVE, while Participants 3 and 5 reported their highest SUDS at the start of the exposure. Participant 2's SUDS ratings also reduced from the start to the end of her two IVEs, but demonstrated a fluctuating pattern during the exposure sessions. The varied changes in SUDS observed across the five participants within IVE sessions is consistent with the diverse patterns reported by adults with social anxiety disorder during exposure (Hayes et al., 2008). It remains unclear whether within-session habituation is a predictor of between-session progress when targeting feared situations in patients with eating disorders.

It should be reiterated that some of the distinctive features of eating disorders,

particularly AN, add complexity to the use of SUDS and self-efficacy ratings as measures of treatment progress. As described earlier, SUDS ratings have been found to increase during and immediately following exposure sessions that involve the consumption of feared foods in patients with eating disorders (Boutelle, 1998; Carter et al., 2001). This increase in anxiety is consistent with the observation that the primary fear of most patients with eating disorders – weight gain – is a longer-term consequence that cannot be challenged adequately in a brief exposure session (Murray et al., 2016), as the impact of exposure is expected to interact with changes in weight. If a patient's weight remains stable over time despite eating feared foods and abstaining from compensatory behavior, one might expect progressive reductions in SUDS. However, if a patient weighs 2 lbs. more in a CBT session following exposure to a feared food, the patient may attribute this weight increase to the food consumed and experience increased anxiety about the food. Moreover, weight gain is a *requirement* of treatment for patients with AN. Indeed, the belief held by patients with AN that increasing food consumption will lead to weight gain is an accurate one. As a result, some have suggested that exposure to feared foods during the weight restoration phase of treatment for AN may inadvertently reinforce the belief that consumption of feared foods results in weight gain (Murray et al., 2016).

On the other hand, patients often overestimate the amount of weight gain they will experience after eating feared foods. For these patients, exposure to feared foods may still be useful while they gain weight in treatment, as exposure treatment followed by weight gain that is *less than expected* could still reduce distress about these foods. Patients with AN can also have idiosyncratic beliefs about certain foods, such as avoiding sweets but eating other foods that have the same caloric value. In these cases, exposure to feared foods may help patients with AN learn

that, in general, the magnitude of weight gain is no greater when eating feared foods than non-feared foods of the same caloric value. Even if exposure therapy is helpful in reducing distress about feared foods in these ways, the complex relationship between food consumption and longer-term fears of weight gain is likely to produce variable SUDS and self-efficacy ratings over the course of treatment.

Further complicating this picture is the functional role that fear plays for many patients with AN (Garner & Bemis, 1982), as these individuals often exert effort to maintain their fear of food. It may be the case that patients' SUDS and self-efficacy ratings in response to exposure will be impacted by their motivation to recover and interest in reducing this fear. Given observations that patients with eating disorders exhibit ongoing fluctuations in motivation (Vitousek et al., 1998), it would be reasonable to expect their ratings on outcome measures to follow this variable pattern. It is also possible that patients may experience an increase in anxiety as they begin to contemplate taking on fear and avoidance. Additional research is warranted to try to disentangle the complex interaction of factors that may impact patients' response to exposure therapy, explore how weight changes may affect variability in SUDS and self-efficacy ratings following exposure, and identify potential differences between exposure to feared foods and feared situations in patients with eating disorders.

The potential value of targeting eating, weight, and shape situations. In general, participants reported relatively high SUDS and low self-efficacy ratings throughout treatment, even as other measures indicated improvement. For instance, Participant 2 obtained low scores on the EDE-Q, BSQ-8, and FOFM at intake with the CCBT-ED, and reported that she was no longer engaging in binge eating. Based on this information, one might conclude that this

participant did not need to receive specialized treatment for her eating disorder. On the other hand, she reported SUDS ratings of 50 or greater on all but three items on the IVESS, suggesting that she continued to experienced distress about a wide variety of situations related to eating, weight, and shape that may be important to address in treatment. Given preliminary evidence that at least some patients with eating disorders report high SUDS and low self-efficacy ratings even when improving on other measures of eating disorder symptoms, it may be the case that distress and self-efficacy related to eating, weight, and shape situations represent unique constructs that provide information above and beyond the concepts measured by the EDE-Q, BSQ-8, and FOFM.

One measure that may overlap with the situations included in the IVESS is the Eating Disorder Recovery Self-Efficacy Questionnaire (EDRSQ; Pinto, Guarda, Heinberg, & DiClemente, 2006). The EDRSQ assesses self-reported confidence to engage in behaviors that are incompatible with having an eating disorder such as eating without thinking about calories and looking in a mirror without thinking about weight loss. The EDRSQ has demonstrated some discriminant validity by yielding small to moderate correlations with the constructs of maturity fears and awareness of society's standards of thinness (Pinto et al., 2006), and significantly predicted length of hospital stay in inpatient and partial hospital programs (Pinto, Heinberg, Coughlin, Fava, & Guarda, 2008). On the other hand, it is unclear whether the EDRSQ provides any additional information above and beyond the EDE-Q and/or BSQ-8. Although the EDRSQ and IVESS both intend to capture constructs related to normative eating, the IVESS consists of a number of very challenging scenarios that have yet to be included in any published measure of recovery from an eating disorder. In view of preliminary data form the present study that there

may be value in measuring and targeting challenging eating, weight, and shape situations, future researchers might consider developing and testing assessment tools that evaluate distress and self-efficacy in these situations. It would also be interesting to administer such a measure to a large sample of individuals in the community to better understand normative levels of distress and self-efficacy in these situations.

Diverse preferences and reactions to IVE. The five participants in the present study demonstrated dramatic variability in their interest in IVE and response to challenging exposure sessions. For example, Participant 2 indicated that the check-in at the start of her first IVE made the exposure feel more artificial, requested that a second IVE be conducted with a new IVE therapist who would stay in character for the entire exposure session, and expressed interest in increasing the difficulty level of the second IVE. In contrast, Participant 3 noted that she really valued the check-ins and debriefing as part of her IVEs, found the IVE in which she received some critical comments more difficult than she had expected, and expressed some regret that she agreed to participate in such a challenging IVE.

In sharp contrast to the difficult IVEs completed by Participant 2 was the session designed for Participant 4, which was the least challenging exposure conducted over the course of the present study. Compared to the other participants, Participant 4 appeared to have the most difficulty with her IVE, which simply involved eating crackers while having a friendly conversation with her therapist in the clinic. Interestingly, Participants 2 and 4 both presented to the CCBT-ED in remission from BED, suggesting that patients with the same diagnostic profile can exhibit substantially different responses to IVE. While the results from the present study's five participants suggest that patients with eating disorders exhibit diverse preferences and

reactions to IVE, this supposition needs to be explored by research using a larger sample of patients with eating disorders.

Implications

Although the present study's results do not allow for any conclusions about the efficacy of IVE, evidence that challenging IVE sessions were perceived as valuable by at least some of the study's participants may have some useful implications. It is worth noting that the satisfaction with IVE endorsed by at least three study participants is consistent with the anecdotal impressions of past therapists and the supervisor at the CCBT-ED. More than 100 patients with eating disorders have been treated at the CCBT-ED during the past two decades, at least one-third of whom received challenging IVE sessions. Although these patients' responses to IVE were not systematically measured, neither the supervisor nor prior CCBT-ED therapists recall any exposure sessions that appeared to cause sustained distress, symptom exacerbation, relapse, or treatment drop-out. A few patients have been persistently reluctant to engage in IVE sessions, and some of these patients dropped out of treatment prematurely; however, such reluctance was typically associated with other indices of poor treatment engagement and compliance such as not keeping food records or failing to engage in behavioral experiments at home, so it is not clear that unwillingness to participate in IVE was specifically linked to treatment termination. Almost all prior CCBT-ED patients reported to their therapists that they perceived IVE as valuable in some way, albeit to varying degrees and at different points throughout treatment.

Despite evidence to the contrary, therapists in both the eating and anxiety disorder fields express concerns that patients will be more likely to drop out of treatment that includes aspects of exposure therapy (Waller, 2009). In view of these concerns with standard exposure protocols,

it would be reasonable to expect that therapists may be even more reluctant to conduct the challenging types of IVE sessions included in the present study, most of which were designed to "overcorrect" by amplifying feared stimuli. The overall findings from this study are inconsistent with the belief that most patients will dislike IVE sessions or drop out of treatment. If future research with larger sample sizes confirms that most patients find challenging IVE sessions valuable, then some reluctant therapists may consider incorporating exposure into treatment.

Additionally, it is hoped that therapists and researchers who already utilize exposure and related interventions for patients with eating disorders will consider implementing and evaluating more challenging exposure sessions that can be applied flexibly to a wide range of eating, weight, and shape situations. Recent studies indicate movement toward testing more challenging and varied types of exposure sessions. For example, Steinglass et al. (2014) evaluated ERP for eating-related situations that appeared to apply the principle of "overcorrection," such as by having a patient keep her hand in a bag of chips for an extended period of time, while the body image exposures tested by Trottier et al. (2015) included patients eating a high energy food item in front of a romantic interest and trying on tight fitted jeans in a store. Moving to more challenging IVEs may be a logical next step for exposure-oriented researchers and clinicians, and could be a particularly useful intervention later in treatment when many patients report reduced anxiety about less challenging eating, weight, and shape situations.

Limitations and Future Directions

Limitations related to study design. The primary limitation of the current project was the failure to identify appropriate comparison variables, at least for four of the five participants, which is required in order to make cause-and-effect conclusions when using a multiple-baseline

design across behaviors. Unfortunately, ratings of variables designated as "unrelated" were usually correlated with ratings of the TV(s), which leaves the primary research questions unanswered.

Furthermore, multiple-baseline designs are more convincing when the data are relatively stable prior to the initiation of an intervention. In the present study, however, ratings of TVs often exhibited substantial variability. For example, Participant 2's SUDS ratings frequently increased or decreased from session to session, and sometimes exhibited a change of more than 40 points (see Figure 4), complicating interpretation of data following IVE sessions. Additionally, in the session before Participant 4's IVE, her self-efficacy rating of the TV increased 40 points from the prior session (see Figure 9), which makes the reduction in the session after the IVE difficult to interpret. An alternative design could have postponed the implementation of IVEs until a more stable baseline emerged for the TV. This approach would have served as a logistical challenge in the present study, as IVEs at the CCBT-ED clinic are typically scheduled several weeks in advance and require ongoing planning between the primary therapist, patient, and IVE therapist. Moreover, some participants may never exhibit stable SUDS or self-efficacy ratings throughout the course of treatment.

To reduce the complication of testing the efficacy of IVE when delivered as an additive element to CBT, future multiple-baseline designs could consider providing IVE without CBT. Another alternative would be to conduct a multiple-baseline design across *participants* with clearly defined "CBT only" and "CBT + IVE" phases. In this type of design, the frequency of IVE might occur on a more frequent basis (e.g., at least one IVE session per week). If participants received the CBT + IVE phase at different pre-determined time points, and each

exhibited consistent improvements on outcome measures in the CBT + IVE phase relative to the CBT only phase, then support would be provided for the conclusion that adding IVE to CBT increases overall efficacy. A multiple-baseline design across participants would also circumvent the difficulty involved in identifying variables that are relevant yet uncorrelated to TVs.

While these alternative designs may increase internal validity, they are inconsistent with one of the goals of the present study: to identify the efficacy of IVE without substantially modifying the way in which treatment is conducted at the CCBT-ED. Single-subject research has been proposed as a practical and flexible approach to treatment research without requiring major modifications to the way in which treatment is conducted in clinical practice (Nock et al., 2008). However, results from the present study suggest that more substantial changes to treatment delivery would have been necessary to generate conclusion about whether an additive element (e.g., IVE) increased the overall efficacy of a larger treatment package (e.g., CBT). Without making more substantial modifications, it appears that all of the following criteria would have needed to be met to support the study's primary alternative hypothesis: an eating disorder target that is specifically affected by IVE is identified and tracked at every session; a variable that is affected by CBT but not IVE is identified and tracked at every session; the effects of IVE are robust to factors unrelated to treatment (e.g., stressors in the participant's life); IVE is implemented only after ratings of the target variable exhibit stability over time; the effects of IVE are powerful enough to impact the target variable to a noticeably greater extent than CBT; and the effects of IVE on the target variable occur quickly or are so robust that they continue to impact the target variable for several subsequent sessions. Overall, it appears that a multiple-baseline design across behaviors designed to explore the efficacy of an additive element to a

larger treatment package may be untenable without substantially modifying clinical practice, unless the additive element is predicted to have an extremely powerful, immediate, and robust effect on a specific variable without affecting another pre-identified relevant comparison variable.

More commonly, the efficacy of an additive component to a larger treatment package is evaluated using larger sample sizes. Despite avoiding the limitations inherent in smaller sample designs, it is worth noting that group designs have a number of problems as well. In particular, researchers must decide whether the addition of a new treatment component will replace content included in the larger treatment package, shorten the time allocated to some treatment elements, or be added to the treatment package, increasing the total amount of treatment offered. The former two options may dilute treatment and mask any beneficial effects of the added treatment, while the latter confounds the content of the additive treatment with the increased quantity of treatment provided. Additionally, group designs require especially large sample sizes to detect the efficacy of additive treatment elements (Bell, Marcus, & Goodlad, 2013), and can be expensive and time consuming (Kazdin, 1982).

Limitations related to study sample. Moreover, any conclusions about the efficacy of IVE are limited to the types of patients obtained in the present study's small sample. It seems particularly noteworthy that the five participants presented with less severe psychopathology than the patients typically treated at the CCBT-ED: no participant met full criteria for AN, BN, or BED; three participants did not report high SUDS ratings for foods; and two participants had recently curtailed binge eating at another clinic before initiating services at the CCBT-ED. Although IVE is assumed to be valuable at addressing a diverse range of eating disorder

symptoms, the intervention was initially designed for more severe patients with AN or BN. It is common for the CCBT-ED to treat patients with AN who are unwilling to introduce feared foods into their diets on their own, as well as patients with BN who predictably binge and/or purge after eating certain foods. For many of these patients, IVE sessions that target feared foods early in treatment are hypothesized to be an important element of CBT to disrupt long-standing behavioral patterns. None of the five participants matched the diagnostic and clinical profile of the patients for whom IVE was initially developed.

Exposure sessions are also hypothesized to be especially indicated for patients who appear "stuck" on certain issues or exhibit minimal improvements in anxiety and self-efficacy about certain foods and eating, weight, and/or shape concerns. Conversely, IVE does not appear necessary for other patients, such as those who are able to reintroduce feared foods into their diets, abstain from binge eating and purging, give up disordered dietary rules and rituals, and become confident in a wide range of eating settings and situations without participating in IVE sessions. Indeed, one patient who consented to participate in the present study did not receive any IVE sessions precisely because she achieved these improvements through CBT without therapist-assisted exposure. While the IVE sessions conducted in the present study were predicted to be valuable, they did not seem essential to break through an important issue for most of the participants. For example, both Participants 1 and 2 endorsed self-efficacy ratings greater than 70 for TVs before participating in an IVE session, and indicated in CBT sessions that they were improving in these domains. Although the IVEs conducted for these two participants were relevant to issues brought up during treatment, exposure was likely not an imperative intervention for either participant to exhibit continued improvements.

Interestingly, the study participant for whom IVE may have been the most indicated was also the patient who was most resistant to and least satisfied with IVE. Participant 4 reported that eating a noisy food (i.e., crackers) with her therapist during her one IVE session was much more challenging than she had anticipated and led to "regressive binge-eating behavior." The significant difficulty that Participant 4 experienced with this relatively easy IVE suggested that eating in social situations was an issue that she was indeed "stuck" on. While other CBT interventions may have been valuable in addressing this concern – such as cognitive restructuring or encouraging the patient to eat at social events on her own (i.e., between-session exposure without therapist assistance) – conducting therapist-assisted IVE may have been a particularly valuable approach for this individual. Future research could investigate the impact of IVE on patients with other eating disorder diagnoses and presentations, the effects of more frequent IVE sessions, and how various patient characteristics predict responses to IVE.

It may also be valuable to explore how various patient characteristics and treatment elements moderate the efficacy of exposure therapy. Despite the widely held belief that corrective learning is the key mechanism through which exposure therapy works, little is known about how and when cognitions change in response to the treatment. Research from the anxiety disorder literature suggests that attentional bias toward threatening stimuli and greater emotional variability during exposure sessions are associated with improved outcomes (Culver, Stoyanova, & Craske, 2012; Niles, Mesri, Burkland, Lieberman, & Craske, 2013; Price, Tone, & Anderson, 2011; Waters, Mogg, & Bradley, 2012). Additionally, a study with anxious children found that debriefing after an exposure session (e.g., discussing the experience, reviewing SUDS ratings) predicted longer-term improvement, while preparing for the exposure session beforehand (e.g.,

reviewing the rationale, role-playing with the therapist) did not (Tiwari, Kendall, Hoff, Harrison, & Fizur, 2013). Further research investigating these questions may provide important information about how to modify exposure therapy to maximize corrective learning, both for patients with eating disorders and those with other psychological conditions.

Limitations related to defining CBT sessions. CBT sessions did not follow a specific protocol and included a diverse assortment of interventions. While this approach is consistent with clinical practice at the CCBT-ED, it makes it difficult to define the treatment that each participant received. While convergence on the study's CCBT Checklists is encouraging, the lack of stronger kappa coefficients indicates that there were some inconsistencies between the therapist(s) and primary investigator's ratings of CBT sessions.

There are several potential explanations for these discrepancies. First, therapists made ratings from memory after conducting CBT sessions while the primary investigator completed checklists while listening to audio recordings. Second, overlap between intervention domains may have contributed to uncertainty when categorizing some treatment approaches. Third, participating therapists may have distinct approaches to classifying the diverse content of CBT into various interventions and categories. As process ratings were not a central focus of the present study, therapists had received only brief instruction in coding of treatment interventions. More extensive training may have improved inter-rater reliability between therapists and the primary investigator. Despite these limitations, the substantial agreement between study therapists and the primary investigator suggests that the former provided relatively accurate descriptions of the content of CBT sessions.

Conclusion

Overall, the results of the present study are inconclusive. Although variables targeted by IVE often exhibited predicted changes in mean and level following IVE sessions, similar patterns were observed in variables not targeted by exposure. Moreover, visual inspection of trend and findings from ALLISON-MT did not indicate that the rate of change increased or decreased in the predicted direction in response to IVE sessions, likely because greater changes in trend generally occurred toward the beginning of the treatment course, and IVE sessions were more often implemented later in treatment. Taken together, it is unclear whether improvements in TVs are related to IVE, CBT, time, patient characteristics, regression to the mean, or other factors. At the very least, the present study provides preliminary evidence that challenging exposure sessions can be acceptable to some patients with eating disorders. Consistent with the CCBT-ED clinic's impression of patients' response to IVE over the past two decades, most study participants reported satisfaction with IVE, recommended that other patients with eating disorders receive IVE, and did not drop out of treatment because of challenging exposure sessions. It is hoped that these results will encourage further clinical research evaluating the utility of challenging exposure sessions designed to "overcorrect" by intentionally amplifying patient's fears of a wide range of scenarios related to eating, weight, and shape.

Appendix A: Food Phobia Survey

ID # _____

FOOD SURVEY: I

Please rate each of the foods on the following pages according to:

*- **how frequently, on average, you have eaten that food over the past year***

*If you have been **hospitalized** at any point during the past year, rate each item according to how frequently you have eaten it when you were not in the hospital.*

*- **how much you have feared eating or felt guilty about eating that food over the past year***

Please rate this item independently from how often you have eaten the food and from how much you like the food:

- for example, if you never eat spinach because you don't like spinach, but you would not feel at all fearful or guilty about eating spinach, you would assign a "1" for frequency and a "1" for fear/guilt in rating that item.

- for example, if you never eat fudge because you feel very fearful about eating it or would feel very guilty if you ate it, you would assign a "1" for frequency and a "5" for fear/guilt in rating that item.

Interpreting food items

*Note that some of the items specify the type of food very precisely - for example, the questionnaire asks separately about whole milk, 2% milk, and skim milk. Other items are not specific about particular characteristics of the food. In these cases, you should assume that you are being asked about the most **usual** or **typical** version of the food.*

- for example, if the item simply says "hot dog," you should assume that the meat consists of beef and pork, since that is the most "typical" kind of hot dog.

- for example, if the item says "tuna sandwich," you should assume that the sandwich is made of 2 pieces of regular bread and is filled with tuna mixed with mayonnaise, since that is the most "usual" kind of tuna sandwich.

*You should also assume that the items refer to **usual** or **typical portion sizes**.*

Please check one of the following categories to describe yourself:

1. ____ non-vegetarian (I eat a range of foods that includes a variety of meats)
   Please check this category if you are someone who eats meat infrequently, but who does eat meat occasionally; the categories below should be endorsed only by people who never eat meat or almost never (no more than once or twice a year) eat meat.
2. ____ poultry/fish only (I eat poultry and fish, but do not eat other meats)
3. ____ fish only (I eat fish, but do not eat poultry or other meats)
4. ____ lacto-ovo vegetarian (I eat dairy products and eggs, but do not eat any meat or fish)
5. ____ vegan (I do not eat animal products of any kind, including dairy products or eggs)
6. ____ other (please explain)

_____

NOTE: *If you are a vegetarian or partial vegetarian, please do **not** include any **ethical** concerns in making the "fear/guilt" ratings on the following pages - rate the items according to the fear/guilt (if any) that you feel or would feel about eating specific foods for **other** reasons.*

Please list below any foods to which you have an established allergic response:

*(you do not need to list foods that upset your stomach - only those foods to which you have a known **allergy**)*

_____

Please use these scales in rating each item for frequency and fear/guilt, circling one number in both columns:

Frequency:	never	rarely	occasionally	often	very often
	1	2	3	4	5
Fear/guilt:	none	slight	moderate	strong	very strong

	Frequency	**Fear/Guilt**	
1. regular cheese (e.g., cheddar, Swiss, Monterey jack)	1 2 3 4 5	1 2 3 4 5	____
2. oatmeal (plain)	1 2 3 4 5	1 2 3 4 5	____
3. fried rice	1 2 3 4 5	1 2 3 4 5	____
4. potato chips (low fat)	1 2 3 4 5	1 2 3 4 5	____
5. baked chicken breast	1 2 3 4 5	1 2 3 4 5	____
6. bacon	1 2 3 4 5	1 2 3 4 5	____
7. grilled chicken sandwich	1 2 3 4 5	1 2 3 4 5	____
8. spaghetti with meat sauce	1 2 3 4 5	1 2 3 4 5	____
9. garden burger	1 2 3 4 5	1 2 3 4 5	____
10. tomato or cucumber salad	1 2 3 4 5	1 2 3 4 5	____
11. saimin	1 2 3 4 5	1 2 3 4 5	____
12. snow peas (Chinese pea pods)	1 2 3 4 5	1 2 3 4 5	____
13. candied yams	1 2 3 4 5	1 2 3 4 5	____
14. avocado	1 2 3 4 5	1 2 3 4 5	____
15. tomato juice or V-8 juice	1 2 3 4 5	1 2 3 4 5	____
16. butterscotch or vanilla pudding (regular)	1 2 3 4 5	1 2 3 4 5	____
17. ketchup	1 2 3 4 5	1 2 3 4 5	____
18. carrot cake with cream cheese frosting	1 2 3 4 5	1 2 3 4 5	____
19. corn	1 2 3 4 5	1 2 3 4 5	____
20. turkey sandwich	1 2 3 4 5	1 2 3 4 5	____
21. rice cake	1 2 3 4 5	1 2 3 4 5	____
22. 2% milk	1 2 3 4 5	1 2 3 4 5	____
23. pretzels	1 2 3 4 5	1 2 3 4 5	____
24. caramel-coated popcorn (regular)	1 2 3 4 5	1 2 3 4 5	____
25. taco with shredded beef	1 2 3 4 5	1 2 3 4 5	____
26. tomato soup	1 2 3 4 5	1 2 3 4 5	____
27. cappucino or cocoa (low fat)	1 2 3 4 5	1 2 3 4 5	____
28. chocolate chip cookies	1 2 3 4 5	1 2 3 4 5	____
29. frozen yogurt	1 2 3 4 5	1 2 3 4 5	____
30. apple	1 2 3 4 5	1 2 3 4 5	____
31. taco salad	1 2 3 4 5	1 2 3 4 5	____
32. sushi	1 2 3 4 5	1 2 3 4 5	____
33. power bar or cereal bar	1 2 3 4 5	1 2 3 4 5	____
34. skim milk	1 2 3 4 5	1 2 3 4 5	____
35. soft or semi-soft cheese (e.g., brie, camembert)	1 2 3 4 5	1 2 3 4 5	____
36. hamburger	1 2 3 4 5	1 2 3 4 5	____
37. green salad with regular salad dressing	1 2 3 4 5	1 2 3 4 5	____
38. tea or iced tea	1 2 3 4 5	1 2 3 4 5	____
39. fudgesicle (low fat)	1 2 3 4 5	1 2 3 4 5	____
40. cantaloupe or honeydew melon	1 2 3 4 5	1 2 3 4 5	____

Frequency:	never	rarely	occasionally	often	very often
	1	2	3	4	5
Fear/guilt:	none	slight	moderate	strong	very strong

	Frequency	**Fear/Guilt**	
41. milkshake	1 2 3 4 5	1 2 3 4 5	____
42. cheese lasagna	1 2 3 4 5	1 2 3 4 5	____
43. muffin (blueberry or cranberry)	1 2 3 4 5	1 2 3 4 5	____
44. white rice	1 2 3 4 5	1 2 3 4 5	____
45. omelet made with egg whites or low-fat egg substitute	1 2 3 4 5	1 2 3 4 5	____
46. dried vegetable chips	1 2 3 4 5	1 2 3 4 5	____
47. fried calamari	1 2 3 4 5	1 2 3 4 5	____
48. steak	1 2 3 4 5	1 2 3 4 5	____
49. tuna sandwich	1 2 3 4 5	1 2 3 4 5	____
50. cheese/veggie wrap or pita	1 2 3 4 5	1 2 3 4 5	____
51. miso soup	1 2 3 4 5	1 2 3 4 5	____
52. mixed vegetables with butter sauce	1 2 3 4 5	1 2 3 4 5	____
53. baked potato	1 2 3 4 5	1 2 3 4 5	____
54. grapes	1 2 3 4 5	1 2 3 4 5	____
55. cappucino or cocoa (regular milk)	1 2 3 4 5	1 2 3 4 5	____
56. fruit juice popsicle	1 2 3 4 5	1 2 3 4 5	____
57. mustard	1 2 3 4 5	1 2 3 4 5	____
58. berries with cream, whipped cream, or sour cream	1 2 3 4 5	1 2 3 4 5	____
59. macaroni salad	1 2 3 4 5	1 2 3 4 5	____
60. meatless chili and rice	1 2 3 4 5	1 2 3 4 5	____
61. fruit yogurt	1 2 3 4 5	1 2 3 4 5	____
62. cereal	1 2 3 4 5	1 2 3 4 5	____
63. doughnut	1 2 3 4 5	1 2 3 4 5	____
64. potato chips (regular)	1 2 3 4 5	1 2 3 4 5	____
65. plate lunch with teriyaki beef	1 2 3 4 5	1 2 3 4 5	____
66. asparagus	1 2 3 4 5	1 2 3 4 5	____
67. french fries	1 2 3 4 5	1 2 3 4 5	____
68. fruit juice (apple, orange, guava, passion fruit)	1 2 3 4 5	1 2 3 4 5	____
69. hot fudge sundae	1 2 3 4 5	1 2 3 4 5	____
70. snack cakes (e.g., Twinkies, HoHos, Ding Dongs)	1 2 3 4 5	1 2 3 4 5	____
71. margarine (regular)	1 2 3 4 5	1 2 3 4 5	____
72. green salad with vinegar or lemon juice	1 2 3 4 5	1 2 3 4 5	____
73. grilled mahi burger	1 2 3 4 5	1 2 3 4 5	____
74. bean burrito	1 2 3 4 5	1 2 3 4 5	____
75. soy milk or rice dream	1 2 3 4 5	1 2 3 4 5	____
76. cheese omelet (whole eggs, regular cheese)	1 2 3 4 5	1 2 3 4 5	____
77. whole wheat bread	1 2 3 4 5	1 2 3 4 5	____
78. scone	1 2 3 4 5	1 2 3 4 5	____
79. popcorn (plain, air-popped)	1 2 3 4 5	1 2 3 4 5	____
80. pastrami or corned beef sandwich	1 2 3 4 5	1 2 3 4 5	____

Frequency:	never	rarely	occasionally	often	very often
	1	2	3	4	5
Fear/guilt:	none	slight	moderate	strong	very strong

	Frequency	**Fear/Guilt**	
81. fettucine alfredo	1 2 3 4 5	1 2 3 4 5	____
82. green beans	1 2 3 4 5	1 2 3 4 5	____
83. mango or papaya	1 2 3 4 5	1 2 3 4 5	____
84. protein drink	1 2 3 4 5	1 2 3 4 5	____
85. beer	1 2 3 4 5	1 2 3 4 5	____
86. brownies	1 2 3 4 5	1 2 3 4 5	____
87. tabasco or chili sauce	1 2 3 4 5	1 2 3 4 5	____
88. strawberries	1 2 3 4 5	1 2 3 4 5	____
89. peas	1 2 3 4 5	1 2 3 4 5	____
90. manapua (steamed, with pork filling)	1 2 3 4 5	1 2 3 4 5	____
91. cottage cheese (low fat)	1 2 3 4 5	1 2 3 4 5	____
92. brown rice	1 2 3 4 5	1 2 3 4 5	____
93. cinnamon roll	1 2 3 4 5	1 2 3 4 5	____
94. crackers (e.g., saltines, soda crackers)	1 2 3 4 5	1 2 3 4 5	____
95. turkey (white meat)	1 2 3 4 5	1 2 3 4 5	____
96. fried fish	1 2 3 4 5	1 2 3 4 5	____
97. spam	1 2 3 4 5	1 2 3 4 5	____
98. macaroni and cheese	1 2 3 4 5	1 2 3 4 5	____
99. chicken noodle soup	1 2 3 4 5	1 2 3 4 5	____
100. jello (diet)	1 2 3 4 5	1 2 3 4 5	____
101. fruit smoothie	1 2 3 4 5	1 2 3 4 5	____
102. hot dog and bun	1 2 3 4 5	1 2 3 4 5	____
103. sun chips or wheat chips	1 2 3 4 5	1 2 3 4 5	____
104. trail mix (nuts, sunflower seeds, dried fruit)	1 2 3 4 5	1 2 3 4 5	____
105. pork or beef chow mein with noodles	1 2 3 4 5	1 2 3 4 5	____
106. potato salad	1 2 3 4 5	1 2 3 4 5	____
107. coffee or iced coffee	1 2 3 4 5	1 2 3 4 5	____
108. oatmeal cookies	1 2 3 4 5	1 2 3 4 5	____
109. margarine (low fat)	1 2 3 4 5	1 2 3 4 5	____
110. tofu with vegetables	1 2 3 4 5	1 2 3 4 5	____
111. hard-boiled egg (whole)	1 2 3 4 5	1 2 3 4 5	____
112. English muffin	1 2 3 4 5	1 2 3 4 5	____
113. popcorn (regular, buttered)	1 2 3 4 5	1 2 3 4 5	____
114. shoyu chicken	1 2 3 4 5	1 2 3 4 5	____
115. kalua pork	1 2 3 4 5	1 2 3 4 5	____
116. pasta with vegetables and olive oil	1 2 3 4 5	1 2 3 4 5	____
117. cauliflower	1 2 3 4 5	1 2 3 4 5	____
118. banana	1 2 3 4 5	1 2 3 4 5	____
119. ice cream bar (e.g., Dove Bar)	1 2 3 4 5	1 2 3 4 5	____
120. butter	1 2 3 4 5	1 2 3 4 5	____

Frequency:	never	rarely	occasionally	often	very often
	1	2	3	4	5
Fear/guilt:	none	slight	moderate	strong	very strong

	Frequency	**Fear/Guilt**	
121. orange	1 2 3 4 5	1 2 3 4 5	____
122. bean salad	1 2 3 4 5	1 2 3 4 5	____
123. carrots	1 2 3 4 5	1 2 3 4 5	____
124. wine	1 2 3 4 5	1 2 3 4 5	____
125. jello (regular)	1 2 3 4 5	1 2 3 4 5	____
126. plain yogurt	1 2 3 4 5	1 2 3 4 5	____
127. cream cheese	1 2 3 4 5	1 2 3 4 5	____
128. bagel (plain)	1 2 3 4 5	1 2 3 4 5	____
129. waffle or pancakes with syrup	1 2 3 4 5	1 2 3 4 5	____
130. nuts (peanuts, macadamias, cashews, pecans)	1 2 3 4 5	1 2 3 4 5	____
131. fried chicken	1 2 3 4 5	1 2 3 4 5	____
132. Portuguese sausage	1 2 3 4 5	1 2 3 4 5	____
133. stuffed peppers with rice and tomatoes	1 2 3 4 5	1 2 3 4 5	____
134. cheese and veggie pizza	1 2 3 4 5	1 2 3 4 5	____
135. chicken broth	1 2 3 4 5	1 2 3 4 5	____
136. grilled chicken caesar salad	1 2 3 4 5	1 2 3 4 5	____
137. Portuguese bean soup	1 2 3 4 5	1 2 3 4 5	____
138. creamed spinach	1 2 3 4 5	1 2 3 4 5	____
139. raisins or dried fruit	1 2 3 4 5	1 2 3 4 5	____
140. Diet Coke or Pepsi	1 2 3 4 5	1 2 3 4 5	____
141. mocha (regular milk, whipped cream)	1 2 3 4 5	1 2 3 4 5	____
142. shave ice	1 2 3 4 5	1 2 3 4 5	____
143. malasadas	1 2 3 4 5	1 2 3 4 5	____
144. premium ice cream (e.g., Ben & Jerry's)	1 2 3 4 5	1 2 3 4 5	____
145. soy sauce	1 2 3 4 5	1 2 3 4 5	____
146. sour cream (regular)	1 2 3 4 5	1 2 3 4 5	____
147. chicken or shrimp stir fry	1 2 3 4 5	1 2 3 4 5	____
148. crackers (e.g., Ritz, Triscuits)	1 2 3 4 5	1 2 3 4 5	____
149. cottage cheese (regular)	1 2 3 4 5	1 2 3 4 5	____
150. whole milk	1 2 3 4 5	1 2 3 4 5	____
151. white bread	1 2 3 4 5	1 2 3 4 5	____
152. granola bar	1 2 3 4 5	1 2 3 4 5	____
153. canned tuna (water-packed)	1 2 3 4 5	1 2 3 4 5	____
154. lean ground beef	1 2 3 4 5	1 2 3 4 5	____
155. barbecued ribs	1 2 3 4 5	1 2 3 4 5	____
156. baked potato stuffed with cheese	1 2 3 4 5	1 2 3 4 5	____
157. peanut butter sandwich	1 2 3 4 5	1 2 3 4 5	____
158. lima beans	1 2 3 4 5	1 2 3 4 5	____
159. kahlua and cream	1 2 3 4 5	1 2 3 4 5	____
160. mayonnaise	1 2 3 4 5	1 2 3 4 5	____

Frequency:	never	rarely	occasionally	often	very often
	1	2	3	4	5
Fear/guilt:	none	slight	moderate	strong	very strong

	Frequency	**Fear/Guilt**	
161. low-fat cheese (cheddar, Swiss, Monterey jack)	1 2 3 4 5	1 2 3 4 5	____
162. muffin (bran)	1 2 3 4 5	1 2 3 4 5	____
163. broiled fish	1 2 3 4 5	1 2 3 4 5	____
164. lean roast beef	1 2 3 4 5	1 2 3 4 5	____
165. ham and cheese sandwich	1 2 3 4 5	1 2 3 4 5	____
166. vegetable quiche	1 2 3 4 5	1 2 3 4 5	____
167. nachos with cheese	1 2 3 4 5	1 2 3 4 5	____
168. New England clam chowder	1 2 3 4 5	1 2 3 4 5	____
169. onion rings	1 2 3 4 5	1 2 3 4 5	____
170. low-fat ice cream	1 2 3 4 5	1 2 3 4 5	____
171. candy bar (e.g., Milky Way, Snickers)	1 2 3 4 5	1 2 3 4 5	____
172. hollandaise or bearnaise sauce	1 2 3 4 5	1 2 3 4 5	____
173. ham	1 2 3 4 5	1 2 3 4 5	____
174. broccoli with cheese sauce	1 2 3 4 5	1 2 3 4 5	____
175. vanilla wafers	1 2 3 4 5	1 2 3 4 5	____
176. cheesecake	1 2 3 4 5	1 2 3 4 5	____
177. regular Coke or Pepsi	1 2 3 4 5	1 2 3 4 5	____
178. corned beef	1 2 3 4 5	1 2 3 4 5	____
179. turkey frankfurter	1 2 3 4 5	1 2 3 4 5	____
180. cocktail shrimp	1 2 3 4 5	1 2 3 4 5	____

Please list and rate below up to 3 foods <u>not</u> noted on this questionnaire that you eat frequently:

_____	1 2 3 4 5	1 2 3 4 5
_____	1 2 3 4 5	1 2 3 4 5
_____	1 2 3 4 5	1 2 3 4 5

Please list and rate below up to 3 foods <u>not</u> noted on this questionnaire list that you fear eating or feel guilty about eating:

_____	1 2 3 4 5	1 2 3 4 5
_____	1 2 3 4 5	1 2 3 4 5
_____	1 2 3 4 5	1 2 3 4 5

ID # _____

FOOD SURVEY: II

Please rate each of the foods on the following pages according to how <u>desirable</u> or <u>appealing</u> you find this food.

*In this case, we are asking about how much you **like** the food purely in terms of how much it **appeals** to you, independently from any other considerations about whether you consider the food healthy/ unhealthy, safe/dangerous, fattening/slimming, cheap/expensive, easy/difficult, or ethical/unethical.*

If there were <u>no</u> <u>relationship</u> between this food and health, weight, or any other kinds of considerations, how appealing or desirable would this food be for you?

1	2	3	4	5
not at all	slightly	moderately	considerably	extremely

	<u>Appeal</u>	
1. regular cheese (e.g., cheddar, Swiss, Monterey jack)	1 2 3 4 5	____
2. oatmeal (plain)	1 2 3 4 5	____
3. fried rice	1 2 3 4 5	____
4. potato chips (low fat)	1 2 3 4 5	____
5. baked chicken breast	1 2 3 4 5	____
6. bacon	1 2 3 4 5	____
7. grilled chicken sandwich	1 2 3 4 5	____
8. spaghetti with meat sauce	1 2 3 4 5	____
9. garden burger	1 2 3 4 5	____
10. tomato or cucumber salad	1 2 3 4 5	____
11. saimin	1 2 3 4 5	____
12. snow peas (Chinese pea pods)	1 2 3 4 5	____
13. candied yams	1 2 3 4 5	____
14. avocado	1 2 3 4 5	____
15. tomato juice or V-8 juice	1 2 3 4 5	____
16. butterscotch or vanilla pudding (regular)	1 2 3 4 5	____
17. ketchup	1 2 3 4 5	____
18. carrot cake with cream cheese frosting	1 2 3 4 5	____
19. corn	1 2 3 4 5	____
20. turkey sandwich	1 2 3 4 5	____
21. rice cake	1 2 3 4 5	____
22. 2% milk	1 2 3 4 5	____
23. pretzels	1 2 3 4 5	____
24. caramel-coated popcorn (regular)	1 2 3 4 5	____
25. taco with shredded beef	1 2 3 4 5	____
26. tomato soup	1 2 3 4 5	____
27. cappucino or cocoa (low fat)	1 2 3 4 5	____
28. chocolate chip cookies	1 2 3 4 5	____
29. frozen yogurt	1 2 3 4 5	____
30. apple	1 2 3 4 5	____

If there were no relationship between this food and health, weight, or any other kinds of considerations, how appealing or desirable would this food be for you?

1 not at all 2 slightly 3 moderately 4 considerably 5 extremely

	Appeal	
31. taco salad	1 2 3 4 5	____
32. sushi	1 2 3 4 5	____
33. power bar or cereal bar	1 2 3 4 5	____
34. skim milk	1 2 3 4 5	____
35. soft or semi-soft cheese (e.g., brie, camembert)	1 2 3 4 5	____
36. hamburger	1 2 3 4 5	____
37. green salad with regular salad dressing	1 2 3 4 5	____
38. tea or iced tea	1 2 3 4 5	____
39. fudgesicle (low fat)	1 2 3 4 5	____
40. cantaloupe or honeydew melon	1 2 3 4 5	____
41. milkshake	1 2 3 4 5	____
42. cheese lasagna	1 2 3 4 5	____
43. muffin (blueberry or cranberry)	1 2 3 4 5	____
44. white rice	1 2 3 4 5	____
45. omelet made with egg whites or low-fat egg substitute	1 2 3 4 5	____
46. dried vegetable chips	1 2 3 4 5	____
47. fried calamari	1 2 3 4 5	____
48. steak	1 2 3 4 5	____
49. tuna sandwich	1 2 3 4 5	____
50. cheese/veggie wrap or pita	1 2 3 4 5	____
51. miso soup	1 2 3 4 5	____
52. mixed vegetables with butter sauce	1 2 3 4 5	____
53. baked potato	1 2 3 4 5	____
54. grapes	1 2 3 4 5	____
55. cappucino or cocoa (regular milk)	1 2 3 4 5	____
56. fruit juice popsicle	1 2 3 4 5	____
57. mustard	1 2 3 4 5	____
58. berries with cream, whipped cream, or sour cream	1 2 3 4 5	____
59. macaroni salad	1 2 3 4 5	____
60. meatless chili and rice	1 2 3 4 5	____
61. fruit yogurt	1 2 3 4 5	____
62. cereal	1 2 3 4 5	____
63. doughnut	1 2 3 4 5	____
64. potato chips (regular)	1 2 3 4 5	____
65. plate lunch with teriyaki beef	1 2 3 4 5	____
66. asparagus	1 2 3 4 5	____
67. french fries	1 2 3 4 5	____
68. fruit juice (apple, orange, guava, passion fruit)	1 2 3 4 5	____
69. hot fudge sundae	1 2 3 4 5	____
70. snack cakes (e.g., Twinkies, HoHos, Ding Dongs)	1 2 3 4 5	____

If there were no relationship between this food and health, weight, or any other kinds of considerations, how appealing or desirable would this food be for you?

1 not at all 2 slightly 3 moderately 4 considerably 5 extremely

	Appeal	
71. margarine (regular)	1 2 3 4 5	____
72. green salad with vinegar or lemon juice	1 2 3 4 5	____
73. grilled mahi burger	1 2 3 4 5	____
74. bean burrito	1 2 3 4 5	____
75. soy milk or rice dream	1 2 3 4 5	____
76. cheese omelet (whole eggs, regular cheese)	1 2 3 4 5	____
77. whole wheat bread	1 2 3 4 5	____
78. scone	1 2 3 4 5	____
79. popcorn (plain, air-popped)	1 2 3 4 5	____
80. pastrami or corned beef sandwich	1 2 3 4 5	____
81. fettucine alfredo	1 2 3 4 5	____
82. green beans	1 2 3 4 5	____
83. mango or papaya	1 2 3 4 5	____
84. protein drink	1 2 3 4 5	____
85. beer	1 2 3 4 5	____
86. brownies	1 2 3 4 5	____
87. tabasco or chili sauce	1 2 3 4 5	____
88. strawberries	1 2 3 4 5	____
89. peas	1 2 3 4 5	____
90. manapua (steamed, with pork filling)	1 2 3 4 5	____
91. cottage cheese (low fat)	1 2 3 4 5	____
92. brown rice	1 2 3 4 5	____
93. cinnamon roll	1 2 3 4 5	____
94. crackers (e.g., saltines, soda crackers)	1 2 3 4 5	____
95. turkey (white meat)	1 2 3 4 5	____
96. fried fish	1 2 3 4 5	____
97. spam	1 2 3 4 5	____
98. macaroni and cheese	1 2 3 4 5	____
99. chicken noodle soup	1 2 3 4 5	____
100. jello (diet)	1 2 3 4 5	____
101. fruit smoothie	1 2 3 4 5	____
102. hot dog and bun	1 2 3 4 5	____
103. sun chips or wheat chips	1 2 3 4 5	____
104. trail mix (nuts, sunflower seeds, dried fruit)	1 2 3 4 5	____
105. pork or beef chow mein with noodles	1 2 3 4 5	____
106. potato salad	1 2 3 4 5	____
107. coffee or iced coffee	1 2 3 4 5	____
108. oatmeal cookies	1 2 3 4 5	____
109. margarine (low fat)	1 2 3 4 5	____
110. tofu with vegetables	1 2 3 4 5	____

If there were no relationship between this food and health, weight, or any other kinds of considerations, how appealing or desirable would this food be for you?

1	2	3	4	5
not at all	slightly	moderately	considerably	extremely

	Appeal	
111. hard-boiled egg (whole)	1 2 3 4 5	____
112. English muffin	1 2 3 4 5	____
113. popcorn (regular, buttered)	1 2 3 4 5	____
114. shoyu chicken	1 2 3 4 5	____
115. kalua pork	1 2 3 4 5	____
116. pasta with vegetables and olive oil	1 2 3 4 5	____
117. cauliflower	1 2 3 4 5	____
118. banana	1 2 3 4 5	____
119. ice cream bar (e.g., Dove Bar)	1 2 3 4 5	____
120. butter	1 2 3 4 5	____
121. orange	1 2 3 4 5	____
122. bean salad	1 2 3 4 5	____
123. carrots	1 2 3 4 5	____
124. wine	1 2 3 4 5	____
125. jello (regular)	1 2 3 4 5	____
126. plain yogurt	1 2 3 4 5	____
127. cream cheese	1 2 3 4 5	____
128. bagel (plain)	1 2 3 4 5	____
129. waffle or pancakes with syrup	1 2 3 4 5	____
130. nuts (peanuts, macadamias, cashews, pecans)	1 2 3 4 5	____
131. fried chicken	1 2 3 4 5	____
132. Portuguese sausage	1 2 3 4 5	____
133. stuffed peppers with rice and tomatoes	1 2 3 4 5	____
134. cheese and veggie pizza	1 2 3 4 5	____
135. chicken broth	1 2 3 4 5	____
136. grilled chicken caesar salad	1 2 3 4 5	____
137. Portuguese bean soup	1 2 3 4 5	____
138. creamed spinach	1 2 3 4 5	____
139. raisins or dried fruit	1 2 3 4 5	____
140. Diet Coke or Pepsi	1 2 3 4 5	____
141. mocha (regular milk, whipped cream)	1 2 3 4 5	____
142. shave ice	1 2 3 4 5	____
143. malasadas	1 2 3 4 5	____
144. premium ice cream (e.g., Ben & Jerry's)	1 2 3 4 5	____
145. soy sauce	1 2 3 4 5	____
146. sour cream (regular)	1 2 3 4 5	____
147. chicken or shrimp stir fry	1 2 3 4 5	____
148. crackers (e.g., Ritz, Triscuits)	1 2 3 4 5	____
149. cottage cheese (regular)	1 2 3 4 5	____
150. whole milk	1 2 3 4 5	____

If there were no relationship between this food and health, weight, or any other kinds of considerations, how appealing or desirable would this food be for you?

1	2	3	4	5
not at all	slightly	moderately	considerably	extremely

	Appeal	
151. white bread	1 2 3 4 5	____
152. granola bar	1 2 3 4 5	____
153. canned tuna (water-packed)	1 2 3 4 5	____
154. lean ground beef	1 2 3 4 5	____
155. barbecued ribs	1 2 3 4 5	____
156. baked potato stuffed with cheese	1 2 3 4 5	____
157. peanut butter sandwich	1 2 3 4 5	____
158. lima beans	1 2 3 4 5	____
159. kahlua and cream	1 2 3 4 5	____
160. mayonnaise	1 2 3 4 5	____
161. low-fat cheese (cheddar, Swiss, Monterey jack)	1 2 3 4 5	____
162. muffin (bran)	1 2 3 4 5	____
163. broiled fish	1 2 3 4 5	____
164. lean roast beef	1 2 3 4 5	____
165. ham and cheese sandwich	1 2 3 4 5	____
166. vegetable quiche	1 2 3 4 5	____
167. nachos with cheese	1 2 3 4 5	____
168. New England clam chowder	1 2 3 4 5	____
169. onion rings	1 2 3 4 5	____
170. low-fat ice cream	1 2 3 4 5	____
171. candy bar (e.g., Milky Way, Snickers)	1 2 3 4 5	____
172. hollandaise or bearnaise sauce	1 2 3 4 5	____
173. ham	1 2 3 4 5	____
174. broccoli with cheese sauce	1 2 3 4 5	____
175. vanilla wafers	1 2 3 4 5	____
176. cheesecake	1 2 3 4 5	____
177. regular Coke or Pepsi	1 2 3 4 5	____
178. corned beef	1 2 3 4 5	____
179. turkey frankfurter	1 2 3 4 5	____
180. cocktail shrimp	1 2 3 4 5	____

Please list and rate below up to 3 foods not noted on this questionnaire that you find appealing/desirable.
Rate each one to indicate how frequently you eat it (1 = never, 5 = very often), how much fear/guilt you feel about eating it (1 = none, 5 = very strong), and how appealing you find it (using the scale above).

	Frequency	**Fear/Guilt**	**Appeal**
_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
_____	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Appendix B: In Vivo Exposure Scenarios Scale

IVESS

The following items describe a number of situations related to eating, weight, and shape. Take a minute to read through all the situations on this measure. As you read through each item, please try to imagine yourself in that situation as vividly as you can.

After you have read through all the items on this measure, please go back over the items and write a number on a scale from 0 – 100 in the box next to each one describing how distressed (e.g., anxious, afraid, upset) you think you would be if you were in that situation. A score of ***0 indicates that you would not feel distressed in any way****, while a score of* ***100 indicates that you would feel the greatest distress imaginable****.*

Eating Settings	**Rating of Distress (0 – 100)**
1. Eating in a sit-down restaurant (i.e., where you sit down and order food from a waiter)	
2. Eating in a fast-food restaurant	
3. Eating in a cafeteria	
4. Eating in a movie theater	
5. Eating at a buffet or potluck	

Social Situations	**Rating of Distress (0 – 100)**
6. Receiving ***critical comments*** from someone about ***a meal that you are eating*** (e.g., "that meal has too many carbs in it")	

7. Eating with someone who is making ***critical comments*** about ***their meal*** (e.g., "I shouldn't be eating something with so many calories")	
8. Buying food with someone who ***criticizes*** what ***you are purchasing*** (e.g., "I'd suggest you buy something healthier than that")	
9. ***Declining*** to eat food that is offered to you	

Dietary Rules and Rituals	**Rating of Distress (0 – 100)**
10. Eating a meal ***late*** in the evening (e.g., after 8:00 p.m.)	
11. Eating a meal with ***unknown*** calorie and nutritional properties	
12. Eating a meal in a ***limited period of time*** (e.g., less than 30 minutes)	
13. Eating a meal that was presented to you in an ***unexpected*** situation	
14. Eating a meal that is ***chosen by someone else***	
15. Eating a meal with someone who is ***not*** eating	
16. Eating a meal with someone who is ***eating less*** than you are eating	

17. Eating a meal when you are not hungry	
18. Eating a meal that most people would consider large	
19. Eating a second portion of a meal (i.e., having "seconds")	
20. Selecting food items from a grocery store ***casually and quickly***	

Body Image Situations	**Rating of Distress (0 – 100)**
21. Trying on tight clothing ***by yourself***	
22. Trying on tight clothing ***around others***	
23. Working out at the gym ***with others***	
24. Being in a bathing suit ***around others*** (e.g., at a pool, beach, or lake)	
25. Receiving ***complimentary comments*** from someone about ***your weight or shape*** (e.g., "your body looks great!")	
26. Receiving ***critical comments*** from someone about ***your weight or shape*** (e.g., "you aren't as in-shape as you used to be")	

27. Being with someone who is making ***complimentary comments*** about ***their own weight or shape*** (e.g., "I love being so thin!")

28. Being with someone who is making ***critical comments*** about ***their own weight or shape*** (e.g., "I hate how fat I've become")

29. Looking at yourself in a mirror for an ***extended period of time***

Other Situations (Write In)	**Rating of Distress (0 – 100)**
30.	
31.	
32.	
33.	
34.	
35.	

Appendix C: In Vivo Exposure Feedback Form

Date: _____

The following questions ask about your experiences with in vivo exposure sessions as part of treatment at the Center for Cognitive Behavior Therapy.

Please answer the following questions on a scale from 1 (strongly disagree) to 7 (strongly agree).

1. In vivo exposure sessions added to the *effectiveness* of therapy (i.e., helped me make *more progress*).

Strongly Disagree			*Neither Agree nor Disagree*			*Strongly Agree*
1	2	3	4	5	6	7

2. In vivo exposure sessions added to the *efficiency* of therapy (i.e., helped me make *progress faster*).

Strongly Disagree			*Neither Agree nor Disagree*			*Strongly Agree*
1	2	3	4	5	6	7

3. Because of in vivo exposure sessions, I am *more confident* in my ability to handle a variety of eating- and/or weight-related situations in the future.

Strongly Disagree			*Neither Agree nor Disagree*			*Strongly Agree*
1	2	3	4	5	6	7

4. The *most helpful* in vivo exposure sessions have been the ones that *challenged me the most*.

Strongly Disagree			*Neither Agree nor Disagree*			*Strongly Agree*
1	2	3	4	5	6	7

CONTINUE TO BACK SIDE OF FORM

Please write your responses to the following open-ended questions.

1. What aspects of in vivo exposure sessions have been *helpful*?

2. What aspects of in vivo exposure sessions have been *not useful*?

3. What aspects of in vivo exposure sessions have been *challenging*?

4. Do you think future clients should participate in exposure sessions? Why or why not?

Appendix D: CCBT-ED Therapist Checklist

Therapist(s) Name: _____ Client ID #: _____ Date of Session: _____

In-Session Weight: _____ (Write "N/A" if the patient was not weighed this session)

*Write in the number of self-reported binge and purge episodes **since the last treatment session**:*

Objective Binge Episodes: _____ Subjective Binge Episodes: _____ Purging Episodes: _____

Indicate which of the following interventions were implemented during this treatment session. Next to each applied intervention, write the letter "C" for those conducted with just the client, "F" for those conducted with just the client's family, and "B" for those conducted with both the client and the family (either in joint or separate sessions).

Psychoeducation and Treatment Rationale
_____ Binge-eating and purging psychoeducation
_____ Body image psychoeducation
_____ Case formulation of eating disorder
_____ Explaining the basics and advantages of treatment
_____ Functions of symptoms
_____ Rationale for CBT
_____ Regular eating and dieting psychoeducation
_____ Weight psychoeducation
_____ Other (specify: _____)

Enhancing Motivation and Specific Strategic Techniques
_____ Exploring dissonance between values and behaviors
_____ Functionality of symptoms
_____ Projecting into the future
_____ Pros and cons
_____ Short-term behavior contract
_____ Use of analogies
_____ Other (specify: _____)

In-Session Weighing
_____ Eliciting weight prediction before weigh-in and debriefing following weigh-in
_____ Encouraging client to stop weighing self outside of treatment
_____ Rationale for assessing body weight and in-session weigh-ins
_____ Other (specify: _____)

Self-Monitoring, Meal Planning, and Interrupting the Binge-Purge Cycle
_____ Delay strategies, distraction techniques, and planning alternative behaviors
_____ Food records
_____ Meal planning
_____ Other (specify: _____)

Cognitive Interventions Addressing Eating, Weight, and Shape Concerns
_____ Binge analysis, purge analysis
_____ Enhancing other domains for self-evaluation
_____ Identifying dysfunctional thinking patters, cognitive restructuring, and related cognitive interventions for ED concerns
_____ Problem solving techniques for ED concerns
_____ Other (specify: _____)

Behavioral Interventions Addressing Eating, Weight, and Shape Concerns

_____ Assigning homework related to a recent in vivo exposure session
_____ Back-translating accurate beliefs related to the ED into behaviors
_____ Behavioral experiment for ED concerns
_____ Conducting exposure in session to address body image or other ED concern
_____ Debriefing about an in vivo exposure session
_____ Role-playing in session for ED concerns
_____ Setting up an in vivo exposure session
_____ Other (specify:
_____)

Cognitive and Behavioral Interventions Addressing Concerns Other Than Eating, Weight, and Shape

Cognitive and behavioral interventions for:

_____ academic and/or occupational issues
_____ anxiety-related issues
_____ interpersonal/relationship/family issues
_____ mood-related issues
_____ self-injury
_____ other non-ED issue (describe): _____
_____ other non-ED issue (describe): _____
_____ other non-ED issue (describe): _____

_____ Distress tolerance skills
_____ Emotion regulation skills
_____ Mindfulness skills
_____ Relaxation training
_____ Sleep hygiene
_____ Other (specify: _____)

Relapse Prevention

_____ Developing a plan to address prospective challenges and setbacks
_____ Discussing concerns about ending treatment
_____ Reviewing treatment progress and skills associated with positive outcomes
_____ Other (specify: _____)

Of the interventions endorsed above, rank order the <u>top three</u> that you focused on most during this session by adding the numbers "1," "2," and "3" next to the top three items.

If there was anything notable about this session that could affect the course of treatment, please describe below. Also, if the patient is taking <u>medication</u>, write the medication name, dosage, and reported adherence below.

Appendix E: IVE Form

COMPLETE THIS SIDE DURING GROUP SUPERVISION

Client ID #: _____ Date IVE Session was Formulated: _____

Name of Primary Therapist(s): _____

Specific item(s) that the IVE targets:

1. _____
2. _____
3. _____
4. _____
5. _____

Specific item(s) that the IVE may generalize to:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

Specific item(s) that the IVE will *not* likely generalize to:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

Decision-making process for this IVE:

_____
_____
_____
_____
_____
_____
_____

COMPLETE THIS SIDE DURING OR IMMEDIATELY AFTER THE IVE SESSION

Date of IVE Session: _____

Name of IVE Therapist(s): _____

Approximate Length of IVE Session (in minutes): _____

Describe the IVE session (e.g., what was planned, what actually happened, what the client ate, what you ate, the goals of the session, the client's prediction of how the session would go, the client's perspective of how it went, etc.):

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Document the client's SUDS ratings from this IVE session on a scale from 0 – 100 below:

_____ Sometime before the IVE session (approx. ____ minutes before the session started)

_____ Immediately before the IVE session (approx. ____ minutes before the session started)

_____ During the IVE session (approx. ____ minutes after the session started)
_____ During the IVE session (approx. ____ minutes after the session started)

_____
_____
_____
_____
_____

_____ Immediately after the IVE session (which occurred ____ minutes after the session ended)

_____ Sometime after the IVE session (which occurred ____ minutes after the session ended)

Appendix F: Study Consent Form

Agreement to Participate

Jamal H. Essayli, Primary Investigator
(949) 292-3181, jessayli@hawaii.edu

Kelly M. Vitousek, Faculty Advisor
(808) 956-7326, vitousek@hawaii.edu

You are invited to participate in a research study conducted by Jamal H. Essayli, M.A., as part of his program requirements as a graduate student in the Clinical Studies Program at the University of Hawai‘i at Mānoa (UHM). The overall purpose of this research is to explore the effectiveness of specific elements of treatment in helping people with eating disorders. If you agree to participate, you will be asked to fill out some additional questionnaires throughout the course of assessment and treatment. These questionnaires will provide information about how you experience specific elements of treatment. In particular, the study is interested in learning more about how helpful *in vivo* exposure is for reducing anxiety related to foods and different situations related to eating, weight, and shape. The therapist(s) from whom you receive individual treatment at the Center for Cognitive Behavior Therapy – Eating Disorders Clinic (CCBT-ED) will be responsible for administering these questionnaires. If you choose not to participate, you will still be offered standard treatment at the CCBT-ED, which includes completing questionnaires and participating in exposure sessions. The main difference for individuals who choose to participate is that they will be asked to fill out some additional questionnaires throughout treatment. If you have any questions about these questionnaires at any time, feel free to talk to your therapist about them. You must be at least 14 years old to participate in this study. It is estimated that approximately five individuals receiving treatment at the CCBT-ED will participate in this study.

Study Procedures
Your participation in this study will last for up to one year while you are receiving treatment at the CCBT-ED. If you agree to participate, your therapist will give you the additional questionnaires related to the study approximately once every six weeks, which are estimated to take a total of ten minutes to complete. Your therapist will also give you a brief questionnaire on a more frequent basis at the beginning of treatment sessions, which is estimated to take a total of two minutes to complete. These questionnaires will ask you about feared foods and situations related to eating, weight, and shape.

Risks
You may experience distress or discomfort when completing questionnaire items. If you feel upset or uncomfortable in any way as a result of completing these questionnaires, please inform your therapist.

Benefits
There are no guaranteed benefits for participating in this study. However, as a result of

completing the study's questionnaires on a regular basis, we might be better able to identify foods and situations that are distressing to you and better address these issues in treatment. It is also hoped that the results of this study will provide increased knowledge about what aspects of treatment are effective, particularly *in vivo* exposure.

Confidentiality
Research data will be confidential to the extent allowed by law. Agencies with research oversight, such as the UH Committee on Human Studies, have the authority to review research data. All research records will be stored in a locked file at the CCBT-ED. Names or other identifying information would *never* be associated with presentations, reports, or articles using the data set.

Costs and Compensation
There will be no financial costs to you for participating in this study.

Voluntary Participation
Participation in this research project is completely voluntary. You are free to withdraw from participation at any time during the duration of the project with no penalty or loss of benefit to which you would otherwise be entitled. If you are provided with treatment services at the CCBT-ED, these services will in no way be affected by your decision to participate in or withdraw from this study. If you are interested in withdrawing from this study at any time, you may do so by talking to your CCBT-ED therapist or contacting the primary investigator, Jamal Essayli, at jessayli@hawaii.edu or (949) 292-3181. You may also contact the clinical supervisor, Dr. Kelly Vitousek, with any questions or concerns at vitousek@hawaii.edu or (808) 956-7326.

Questions about the Study
If you have any questions regarding this research project, please contact the primary investigator, Jamal H. Essayli, at jessayli@hawaii.edu or (949) 292-3181, or the clinical supervisor, Dr. Kelly Vitousek, at vitousek@hawaii.edu or (808) 956-7326.

If you have any questions regarding your rights as a research participant, please contact the University of Hawaii Human Studies Program at (808) 956-5007.

Participant:
I have read and understand the above information, and agree to participate in this research project.

Name: _____
(printed)

_____
(signature)

Date: _____

Appendix G: Study Consent Form – Parent Version

Agreement to Participate

Jamal H. Essayli, Primary Investigator
(949) 292-3181, jessayli@hawaii.edu

Kelly M. Vitousek, Faculty Advisor
(808) 956-7326, vitousek@hawaii.edu

Your child has been invited to participate in a research study conducted by Jamal H. Essayli, M.A., as part of his program requirements as a graduate student in the Clinical Studies Program at the University of Hawai'i at Mānoa (UHM). The overall purpose of this research is to explore the effectiveness of specific elements of treatment in helping people with eating disorders. If you agree to your child's participation, he or she will be asked to fill out some additional questionnaires throughout the course of assessment and treatment. These questionnaires will provide information about how your child experience specific elements of treatment. In particular, the study is interested in learning more about how helpful *in vivo* exposure is for reducing anxiety related to foods and different situations related to eating, weight, and shape. The therapist(s) from whom your child receives individual treatment at the Center for Cognitive Behavior Therapy – Eating Disorders Clinic (CCBT-ED) will be responsible for administering these questionnaires. If you do not want your child to participate, he or she will still be offered standard treatment at the CCBT-ED, which includes completing questionnaires and participating in exposure sessions. The main difference for individuals who choose to participate is that they will be asked to fill out additional questionnaires throughout treatment. If your child has any questions about these questionnaires at any time, he or she should feel free to talk to his or her therapist about them. Your child must be at least 14 years old to participate in this study. It is estimated that approximately five individuals receiving treatment at the CCBT-ED will participate in this study.

Study Procedures
Your child's participation in this study will last for up to one year while he or she is receiving treatment at the CCBT-ED. If you agree to your child's participation, your child's therapist will give him or her the additional questionnaires related to the study approximately once every six weeks, which are estimated to take a total of ten minutes to complete. Your therapist will also give your child a brief questionnaire on a more frequent basis at the beginning of treatment sessions, which is estimated to take a total of two minutes to complete. These questionnaires will ask your child about feared foods and situations related to eating, weight, and shape.

Risks
Your child may experience distress or discomfort when completing questionnaire items. If your child feels upset or uncomfortable in any way as a result of completing these questionnaires, he or she should inform the therapist.

Benefits

There are no guaranteed benefits for participating in this study. However, as a result of completing the study's questionnaires on a regular basis, we might be better able to identify foods and situations that are distressing to your child and better address these issues in treatment. It is also hoped that the results of this study will provide increased knowledge about what aspects of treatment are effective, particularly *in vivo* exposure.

Confidentiality
Research data will be confidential to the extent allowed by law. Agencies with research oversight, such as the UH Committee on Human Studies, have the authority to review research data. All research records will be stored in a locked file at the CCBT-ED. Names or other identifying information would *never* be associated with presentations, reports, or articles using the data set.

Costs and Compensation
There will be no financial costs to you or your child for participating in this study.

Voluntary Participation
Participation in this research project is completely voluntary. You may withdraw your child from participation at any time during the duration of the project with no penalty or loss of benefit to which you or your child would otherwise be entitled. If your child is provided with treatment services at the CCBT-ED, these services will in no way be affected by the decision to participate in or withdraw from this study. If you are interested in withdrawing your child from this study at any time, you may do so by talking to your child's CCBT-ED therapist or contacting the primary investigator, Jamal Essayli, at jessayli@hawaii.edu or (949) 292-3181. You may also contact the clinical supervisor, Dr. Kelly Vitousek, with any questions or concerns at vitousek@hawaii.edu or (808) 956-7326.

Questions about the Study
If you have any questions regarding this research project, please contact the primary investigator, Jamal H. Essayli, at jessayli@hawaii.edu or (949) 292-3181, or the clinical supervisor, Dr. Kelly Vitousek, at vitousek@hawaii.edu or (808) 956-7326.

If you have any questions regarding you child's rights as a research participant, please contact the University of Hawaii Human Studies Program at (808) 956-5007.

Participant's Legal Guardian:
I have read and understand the above information, and agree to my child's participation in this research project.

Legal Guardian/Parent's Name: _____
(printed)

_____
(signature)

Date: _____

Appendix H: Study Assent Form

Agreement to Participate

Jamal H. Essayli, Primary Investigator
(949) 292-3181, jessayli@hawaii.edu

Kelly M. Vitousek, Faculty Advisor
(808) 956-7326, vitousek@hawaii.edu

You are invited to participate in a research study. The overall purpose of this research is to explore the effectiveness of specific elements of treatment in helping people with eating disorders. If you agree to participate, you will be asked to fill out some additional questionnaires throughout the course of assessment and treatment. These questionnaires will provide information about how you experience specific elements of treatment. In particular, the study is interested in learning more about how helpful *in vivo* exposure is for reducing anxiety related to foods and different situations related to eating, weight, and shape. The therapist(s) from whom you receive individual treatment at the Center for Cognitive Behavior Therapy – Eating Disorders Clinic (CCBT-ED) will be responsible for administering these questionnaires. If you choose not to participate, you will still be offered standard treatment at the CCBT-ED, which includes completing questionnaires and participating in exposure sessions. The main difference for individuals who choose to participate is that they will be asked to fill out some additional questionnaires throughout treatment. If you have any questions about these questionnaires at any time, feel free to talk to your therapist about them. You must be at least 14 years old to participate in this study.

Study Procedures
Your participation in this study will last for up to one year while you are receiving treatment at the CCBT-ED. If you agree to participate, your therapist will give you the additional questionnaires related to the study approximately once every six weeks, which are estimated to take a total of ten minutes to complete. Your therapist will also give you a brief questionnaire on a more frequent basis at the beginning of treatment sessions, which is estimated to take a total of two minutes to complete. These questionnaires will ask you about feared foods and situations related to eating, weight, and shape.

Risks
You may experience distress or discomfort when completing questionnaire items. If you feel upset or uncomfortable in any way as a result of completing these questionnaires, please inform your therapist.

Benefits
There are no guaranteed benefits for participating in this study. However, as a result of completing the study's questionnaires on a regular basis, we might be better able to identify foods and situations that are distressing to you and better address these issues in treatment. It is also hoped that the results of this study will provide increased knowledge about what aspects of

treatment are effective, particularly *in vivo* exposure.

Confidentiality
Research data will be confidential to the extent allowed by law. Agencies with research oversight, such as the UH Committee on Human Studies, have the authority to review research data. All research records will be stored in a locked file at the CCBT-ED. Names or other identifying information would *never* be associated with presentations, reports, or articles using the data set.

Voluntary Participation
Participation in this research project is completely voluntary. You are free to withdraw from participation at any time during the duration of the project with no penalty or loss of benefit to which you would otherwise be entitled. If you are provided with treatment services at the CCBT-ED, these services will in no way be affected by your decision to participate in or withdraw from this study. If you are interested in withdrawing from this study at any time, you may do so by talking to your CCBT-ED therapist or contacting the primary investigator, Jamal Essayli, at jessayli@hawaii.edu or (949) 292-3181. You may also contact the clinical supervisor, Dr. Kelly Vitousek, with any questions or concerns at vitousek@hawaii.edu or (808) 956-7326.

Questions about the Study
If you have any questions regarding this research project, please contact the primary investigator, Jamal H. Essayli, at jessayli@hawaii.edu or (949) 292-3181, or the clinical supervisor, Dr. Kelly Vitousek, at vitousek@hawaii.edu or (808) 956-7326.

If you have any questions regarding your rights as a research participant, please contact the University of Hawaii Human Studies Program at (808) 956-5007.

Participant:
I have read and understand the above information, and agree to participate in this research project.

Name: _____
(printed)

_____
(signature)

Date: _____

Appendix I: Short Food Hierarchy

Date: _____

Distress

Write a number on a scale from 0 (*no distress*) – 100 (*most distress imaginable*) describing how **distressed** you would be to eat each of the foods below. Note that **higher scores** indicate **more distress**.

Lasagna	85
Avocado	70
Regular buttered popcorn	80
Cheesecake	100
Bagel with cream cheese	90

Self-Efficacy

Write a number on a scale from 0 (*highly uncertain*) – 100 (*completely certain*) describing how **certain** you are that you **can handle eating** each of the foods below. Note that **higher scores** indicate **greater certainty** in your ability to handle eating these foods.

Lasagna	45
Avocado	70
Regular buttered popcorn	50
Cheesecake	0
Bagel with cream cheese	10

Appendix J: Short Scenario Hierarchy

Date: _____

Distress

Write a number on a scale from 0 (*no distress*) – 100 (*most distress imaginable*) describing how **distressed** you imagine yourself to be in each of the situations below. Note that **higher scores** indicate **more distress**.

Eating in a fast-food restaurant	65
Eating a meal with someone who is eating less than you and bragging about how little they are eating	100
Working out at a gym with someone who makes critical comments about your weight or shape	95
Eating a meal with unknown calorie and nutritional information	85
Trying on clothes that are too small in a department store	80

Self-Efficacy

Write a number on a scale from 0 (*highly uncertain*) – 100 (*completely certain*) describing how **certain** you are that you **can handle** each of the situations below. Note that **higher scores** indicate **greater certainty** in your ability to handle these situations.

Eating in a fast-food restaurant	60
Eating a meal with someone who is eating less than you and bragging about how little they are eating	0
Working out at a gym with someone who makes critical comments about your weight or shape	5
Eating a meal with unknown calorie and nutritional information	10
Trying on clothes that are too small in a department store	20

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